



State Highway Congestion Monitoring Program (HICOMP)

Annual Report



June 2006

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Foreword

The purpose of the statewide Highway Congestion Monitoring Program (HICOMP) report is to measure congestion occurring on urban area freeways in California. The California Department of Transportation (Caltrans) has been publishing the HICOMP report since 1987.

The congestion information is also required by statute. In September 2002, the Governor signed into law Assembly Bill (AB) 2535 (Diaz) which states:

“The department shall, within existing resources, collect, analyze, and summarize highway congestion data and make it available upon request to California regional transportation planning agencies, congestion management agencies, and transit agencies.”
(California Government Code Section 14032.6)

The 2004 HICOMP report presents congestion data on California urban freeway segments with a history of recurrent congestion. It does not include congestion on other State highways or local surface streets. Non-recurrent congestion such as weekend, holiday, or special event generated traffic congestion is also not included. This report represents average traffic conditions on a typical weekday and is useful for making regional comparisons of freeway performance only.

Estimates in this report rely on a limited number of observations. Actual conditions vary daily and seasonally. Therefore, data presented in this report may not be comparable to the findings of other studies. For example:

Caltrans Districts derived the daily vehicle hours of delay (dvhd) of 512,000 hours reported in the HICOMP 2004 Report from data collections conducted throughout the State of California in the year 2004. The dvhd reported in the Governor’s Strategic Growth Plan, *Go California*, of 558,000 hours was derived from data collected in 2002 and projected into 2005. Thus, the numbers differ because they come from different sources and were analyzed in a different way. Subsequently, D-4 reported their congestion figures for 2005 and found a 9% increase from 2004. Using the D-4 figures as an example for the State shows that the 558,000 hours reported in *Go California* are exactly 9% higher than the 512,000 hours reported in HICOMP 2004.

1. Introduction

Transportation facility construction and expansion has not kept pace with the growth of travel demand. This has resulted in an increase in urban freeway congestion over the past decade in most California metropolitan areas. From the public's perspective, the most noticeable effect of congestion on urban mobility is increased traffic delay. "Rush-hour" traffic in larger cities no longer occurs only during the traditional A.M. and P.M. peak periods, but also extends into much of a normal day.

Congestion can be described as either *recurrent* or *non-recurrent*. Recurrent congestion is the regular, everyday peak period delays that occur when the design capacity of a freeway is exceeded and low speeds result. Irregular events such as accidents, sporting events, maintenance, or short-term construction cause non-recurrent congestion. This report assumes that non-recurrent congestion is roughly equal to recurrent congestion. The purpose of the current State Highway Congestion Monitoring Program (HICOMP) report is to present recurrent congestion data. In some cases, the report discusses non-recurrent congestion, but in these cases, it is only to arrive at an approximation of the impacts of total congestion.

An objective of Caltrans is to increase the efficiency of existing roads and other transportation facilities in order to reduce delays. The HICOMP report helps Caltrans to meet this objective by identifying the locations and extent of recurrent congestion on California's urban freeways. The HICOMP database provides the information needed to evaluate freeway performance so that Caltrans can establish priorities and direct resources to the areas with the most congestion. Data obtained from the congestion monitoring program also may be used to evaluate the effectiveness of technologies and strategies used to reduce congestion by comparing the changes in congestion before and after the implementation of new systems and programs.

1.1 Definition of Recurrent Congestion

This report defines recurrent congestion as a condition lasting for 15 minutes or longer where travel demand exceeds freeway design capacity and vehicular speeds are 35 miles per hour (mph) or less during peak commute periods on a typical incident-free weekday. This report uses three parameters to describe recurrent congestion:

1. Magnitude
2. Extent
3. Duration

Magnitude is the difference in time between the time it takes to travel a segment at the recorded congested speed and the travel time at 35 mph. Vehicle-hours of delay per day (vhdpd) is the term used to express the magnitude of the delay.

Extent is the length of a freeway segment by direction that experiences speeds below 35 mph for 15 minutes or more. Extent is expressed in terms of congested directional miles (cdm). It is important to note that a one-mile stretch of roadway contains two directional miles (one mile for

each direction of travel). Directional miles differ from lane-miles, which is the number of lanes in a given direction multiplied by the length of the segment in that direction.

Duration is the length of time expressed in hours that the directional segment remains congested.

The HICOMP report discusses the magnitude and extent of congestion. Maps included in the report show the location and duration of congestion for all Caltrans districts experiencing congestion.

1.2 Data Collection Methodologies

Caltrans uses two principal methods to collect congestion data on urban freeways. The most common method is to drive specially equipped cars at regular intervals along freeways during the hours of recurrent peak period congestion. This is called the *floating car* method since the vehicles “float” with the traffic flow (it is also sometimes called the *probe vehicle* method because the vehicles are “probes” in the traffic flow). The second method is to automatically collect data from fixed, regularly spaced electronic sensors embedded in or placed alongside urban area freeways. Currently, over 3,100 directional miles of California freeways are monitored using automatic sensors.

A floating car or probe vehicle system consists of either a fixed transmission sensor mounted in the engine compartment or a global positioning system (GPS). The transmission sensor – or tachometer - counts the number of wheel rotations in one second and sends that data to a laptop computer. Software on the computer then translates this data into meaningful time, distance, and travel speed information. A GPS system uses satellite technology to identify the location of the vehicle. Computer software identifies the freeway, direction of travel, and average speed of the vehicle.

The most common type of fixed electronic surveillance system uses inductive loops (commonly referred to as “loop detectors”), although newer technologies are also being employed such as radar, infrared sensors and, increasingly, vehicle transponder tags such as those used for toll roads or bridges. Communication lines transmit speed and volume data collected by the detectors to a computer in real-time.

Exhibit 1-1 shows each district that reports congestion in the HICOMP report, the counties monitored in that district, and the type of technology used to collect congestion data. Appendix “A” at the end of this report contains a map showing all Caltrans districts and the counties that make up those districts.

Exhibit 1-1: Data Collection Methodology by District Reporting HICOMP Results

District (Office Location) Counties Monitored	Floating Car	Automatic Detection
District 3 (Marysville) El Dorado, Placer, Sacramento	✓	
District 4 (Oakland) Alameda, Contra Costa, Marin, San Francisco San Mateo, Santa Clara, Solano, Sonoma	✓	
District 5 (San Luis Obispo) Monterey, San Luis Obispo Santa Cruz, Santa Barbara	✓	
District 6 (Fresno) Fresno, Kern	✓	
District 7 (Los Angeles) Los Angeles, Ventura	✓	✓
District 8 (San Bernardino) Riverside, San Bernardino	✓	✓
District 10 (Stockton) San Joaquin, Stanislaus	✓	
District 11 (San Diego) San Diego	✓	✓
District 12 (Irvine) Orange	✓	✓

The raw field data, combined with hourly traffic volumes, are converted into average vhdpd and cdm. The following formula produces the total delay associated with each segment:

$$\text{Daily vehicle-hours of delay} = V \times D \times T$$

Where,

V - Volume in vehicles per hour = Number of lanes \times Vehicles per hour per lane (vphpl)¹

D - Duration of congestion in hours

T - Travel time (in hours) to cover a given distance under congested conditions minus the travel time at 35 mph

¹ VPHPL is the design capacity of a road segment. Most districts use a value of 2,000 vphpl, although District 4 (Oakland) has been using a value of 2,200 vphpl since 1995.

2. Statewide Summary

Since last year's HICOMP report, California urban freeway recurrent congestion increased by 2 percent from 503,811 vhdpd to 511,857 vhdpd. CDM of urban area freeways showed a slight increase of around 2 percent over the same period, growing from 1,884 last year to 1,928 in 2004.

Exhibits 2-1 through 2-4 summarize these congestion results for each district:

- Daily vehicle-hours of delay (Exhibit 2-1)
- Congested directional miles (Exhibit 2-2)
- Total directional miles (Exhibit 2-3)
- Congested directional miles to total directional miles (Exhibit 2-4)

As shown in Exhibit 2-1, delay statewide increased to 511,857 vhdpd this year compared to 503,811 last year. Districts 6 (Fresno), 7 (Los Angeles), 8 (San Bernardino/Riverside), 10 (Stockton), and 11 (San Diego) show declines in delay while Districts 3 (Sacramento), 4 (San Francisco Bay Area), and 12 (Orange) showed increases in delay. District 5 was assumed to have not changed since no data collection was performed in 2004. District 12's increase can be partially attributed to a methodological change implemented in 2004.

Two Caltrans districts make up 57 percent of all vhdpd in California. District 7 accounts for around 33 percent of all delay, while District 4 contributes another 24 percent. Districts 11 and 12 account for another 32 percent. The remaining districts contribute only about 11 percent to statewide delay.

Exhibit 2-2 shows the cdm for each district. CDM statewide grew by 2 percent from last year to 1,928. District 4 contributed the most to this increase adding 55 cdm (up 16 percent) while District 6 added 15 miles (up 65 percent). District 7 remained even at 648 miles, which is about a third of all congested miles in the State. Districts 4, 11, and 12 each contributed more than 10 percent each. Together, these four districts make up over 80 percent of all congested miles in the State.

Exhibit 2-3 shows total urban area freeway directional miles for each district. Between 1994 and 2004, statewide total miles grew by nearly 360 miles (nearly 8 percent). This increase is due to a number of factors, principally: (1) In 1993, more existing freeway miles were determined to be "urban" based on the results of the 1990 census, (2) new freeway miles were built, and (3) existing urban road miles were upgraded to "freeway" status. In 1995, Caltrans restructured district boundaries to match county lines. This change meant that some districts "lost" miles that were allocated to other districts. District 10 was most affected by this change.

Exhibit 2-4 illustrates the extent to which congestion is present on the State's freeway network. These results are calculated by taking the cdm (Exhibit 2-2) and dividing by the total directional miles (Exhibit 2-3).

As shown in Exhibit 2-4, 42 percent of the State's total urban freeway miles in 2004 were congested, 1 percent higher than in 2003. Around 70 percent of District 11's urban freeway miles were congested in 2004, and 60 percent of District 7's urban freeway miles were congested. Nearly half of District 12's freeway miles are congested. For each of the remaining districts, fewer than 40 percent of all urban miles were congested.

Exhibit 2-5 and Exhibit 2-6 display the delay and congested mile trends for each district. Exhibit 2-5 shows that District 7 leads the State in vhdpd, but delay in District 4 grew rapidly between 1994 and 2000. Since the year 2000, however, District 4's delay has been declining. District 12 has been showing consistent delay increases since year 2001.

Exhibit 2-6 shows District 7 accounting for the most cdm with District 4 showing steady growth between 1994 and 2000. As with delay, District 4's cdm have also declined, but increase significantly in 2004. Congested miles in Districts 11 and 12 also have been growing rapidly over time, with District 11's congested miles nearly equal to District 4's.

As illustrated in Exhibit 2-7, statewide vhdpd generally have been growing at a faster rate than cdm since 1987. Since 2000, delay had been declining up to 2003 while growth in congested miles has remained relatively flat.

Exhibit 2-8 shows how counties compare in 2003 and 2004 in terms of delay. The top ten most congested counties remained largely unchanged since last year with Los Angeles, Orange, San Diego, and Alameda counties remaining the most congested.

Exhibit 2-9 shows approximate costs that congestion imposes on Californians (non-recurrent congestion is estimated to be equal to recurrent congestion). In 2004, the estimated delay cost California drivers and passengers nearly \$17.1 million per day in lost time and excess fuel consumption. This estimated delay added just over 512 tons of emissions to the air, compared to what would have been emitted at uncongested speeds. These estimates are based on the most recently available data.

Exhibit 2-10 shows changes in annual vehicle miles traveled (VMT) from 1987 to 2004 on highways operated by the State. Despite fluctuations in congestion levels, the State's VMT has increased steadily since the late 1980s.

Exhibit 2-1: Daily Vehicle-Hours of Delay by District 1994-2004

	1994	1995	1996 ⁽⁵⁾	1997 ⁽⁵⁾	1998 ⁽⁴⁾	1999	2000	2001	2002	2003 ⁽⁶⁾	2004 ⁽⁷⁾	Percent of Statewide 2004
District 3	2,676	3,172	3,356	No statewide report developed	7,809	8,907	10,896	16,200	14,872	13,226	17,712	3%
Annual % Change	18%	19%	6%		53%	14%	22%	49%	-8%	-11%	34%	
District 4 ⁽¹⁾	60,400	68,500	90,000		112,000	128,300	177,600	155,500	147,900	121,800	124,190	24%
Annual % Change	-5%	13%	31%		12%	15%	38%	-12%	-5%	-18%	2%	
District 5 ⁽¹⁾	880	n/a			2,020	2,598	5,154	6,016	5,937	6,453	6,453	1%
Annual % Change	-42%				23%	29%	98%	17%	-1%	9%	0%	
District 6	222	223			75	257	334	522	508	507	292	0%
Annual % Change	-20%	0%			-31%	245%	30%	56%	-3%	0%	-42%	
District 7 ⁽²⁾	128,780	132,162			142,857	128,623	166,294	178,491	165,861	178,491	171,438	33%
Annual % Change	12%	3%			3%	-10%	29%	7%	-7%	8%	-4%	
District 8 ⁽³⁾	13,023	13,231			29,368	33,384	38,244	33,079	36,935	29,105	25,798	5%
Annual % Change	-13%	2%			30%	14%	15%	-14%	12%	-21%	-11%	
District 10					2,711	3,292	3,930	3,340	4,127	4,064	3,685	1%
Annual % Change						21%	19%	-15%	24%	-2%	-9%	
District 11 ⁽³⁾	34,195	34,215			42,354	44,203	51,712	58,027	64,595	67,163	65,768	13%
Annual % Change	0%	0%			7%	4%	17%	12%	11%	4%	-2%	
District 12	64,148	63,973			78,906	78,796	71,286	66,522	71,376	83,002	96,522	19%
Annual % Change	0%	0%			7%	0%	-10%	-7%	7%	16%	16%	
Totals	304,324	315,476			418,100	428,360	525,450	517,697	512,112	503,811	511,857	100%
Annual % Change ⁽⁴⁾	3%	4%			10%	2%	23%	-1%	-1%	-2%	2%	

(1) District 5 data from Santa Cruz were extracted from District 4 report in years prior to 1995 when the Santa Cruz area was a part of District 4. No 1995 data are available for District 5.

(2) 2002-04 District 7 figures reflect more comprehensive coverage. Years 1999-2001 revised based on updated analysis.

(3) District 8 began to use automatic freeway detector data on some corridors in 2001. District 11 began to use automatic freeway detector data on some corridors in 1998.

(4) Year 1998 percent change is the annualized percent change for the missing years of data. It is not the total percent change between 1998 and the last year that congestion was monitored.

(5) No statewide report developed in 1996 and 1997. Some districts developed internal reports in 1996.

(6) District 12 and some of District 8 were estimated in 2003 due to lack of data. These numbers have been adjusted based on the updated 2004 results. District 5 was also estimated in 2003 and in 2004.

(7) District 12 implemented a methodological change to include auxiliary lanes in year 2004 which contributed to the increase in delay.

Exhibit 2-2: Urban Area Freeway Congested Directional Miles by District 1994-2004

	1994	1995	1996 ⁽⁵⁾	1997 ⁽⁵⁾	1998 ⁽⁴⁾	1999	2000	2001	2002	2003 ⁽⁶⁾	2004 ⁽⁶⁾	Percent of Statewide 2004
District 3	54	55	60	No statewide report developed	98	83	95	121	112	124	121	6%
Annual % Change	2%	2%	9%		28%	-15%	14%	28%	-8%	11%	-2%	
District 4 ⁽¹⁾	208	268	284		327	338	390	379	369	339	394	20%
Annual % Change	-4%	29%	6%		7%	3%	15%	-3%	-3%	-8%	16%	
District 5 ⁽¹⁾	6	n/a			19	16	41	38	42	53	53	3%
Annual % Change	50%				33%	-17%	159%	-6%	9%	28%	0%	
District 6	11	13			2	13	9	20	16	23	38	2%
Annual % Change	-8%	18%			-49%	645%	-27%	113%	-17%	42%	65%	
District 7 ⁽²⁾	556	556			566	566	617	664	620	648	648	34%
Annual % Change	10%	0%			1%	0%	9%	8%	-7%	5%	0%	
District 8 ⁽³⁾	127	97			90	99	168	127	137	113	110	6%
Annual % Change	8%	-24%			-3%	10%	71%	-25%	9%	-17%	-3%	
District 10					19	27	20	51	51	46	40	2%
Annual % Change						39%	-27%	159%	1%	-9%	-14%	
District 11 ⁽³⁾	66	69			125	172	289	273	269	326	334	17%
Annual % Change	0%	5%			22%	38%	69%	-6%	-1%	21%	3%	
District 12	138	133			204	295	269	254	233	212	190	10%
Annual % Change	-8%	-4%			15%	45%	-9%	-6%	-8%	-9%	-10%	
Totals	1,166	1,191			1,449	1,608	1,898	1,925	1,848	1,884	1,928	100%
Annual % Change ⁽⁴⁾	4%	2%			7%	11%	18%	1%	-4%	2%	2%	

(1) District 5 data from Santa Cruz were extracted from District 4 report in years prior to 1995 when the Santa Cruz area was a part of District 4. No 1995 data are available for District 5.

(2) 2002-03 District 7 figures reflect more comprehensive coverage.

(3) District 8 began to use automatic freeway detector data on some corridors in 2001. District 11 began to use automatic freeway detector data on some corridors in 1998.

(4) Year 1998 percent change is the annualized percent change for the missing years of data. It is not the total percent change between 1998 and the last year that congestion was monitored.

(5) No statewide report developed in 1996 and 1997. Some districts developed internal reports in 1996.

(6) Mileage in District 5 is assumed to have not changed between 2002 and 2004 due to lack of data. Some congested segments were also assumed to not have changed in congested mileage in Districts 8 and 12 since data collection was not performed in some areas.

Exhibit 2-3: Urban Area Freeway Total Directional Miles by District 1994-2004

	1994	1995 ⁽²⁾	1996	1997	1998	1999	2000	2001	2002	2003	2004 ⁽³⁾	Percent of Statewide 2004
District 3	319	319	319	319	319	319	317	317	320	325	325	7%
Annual % Change	0%	0%	0%	0%	0%	0%	-1%	0%	1%	2%	0%	
District 4 ⁽¹⁾	1,000	1,064	1,064	1,064	1,075	1,075	1,074	1,074	1,074	1,104	1,104	24%
Annual % Change	3%	6%	0%	0%	1%	0%	0%	0%	0%	3%	0%	
District 5 ⁽¹⁾	185	226	226	226	226	226	226	226	226	229	229	5%
Annual % Change	0%	22%	0%	0%	0%	0%	0%	0%	0%	1%	0%	
District 6	208	239	239	239	241	255	260	268	268	269	269	6%
Annual % Change	0%	15%	0%	0%	1%	6%	2%	3%	0%	0%	0%	
District 7	1,059	1,059	1,059	1,059	1,061	1,061	1,065	1,065	1,075	1,085	1,085	23%
Annual % Change	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%	
District 8	486	523	526	526	542	542	542	555	572	572	572	12%
Annual % Change	1%	8%	0%	0%	3%	0%	0%	2%	3%	0%	0%	
District 10	269	170	170	178	178	178	178	182	182	185	185	4%
Annual % Change	0%	-37%	0%	5%	0%	0%	0%	2%	0%	2%	0%	
District 11	472	449	453	453	458	458	464	464	464	478	478	10%
Annual % Change	0%	-5%	1%	0%	1%	0%	1%	0%	0%	3%	0%	
District 12	277	291	315	340	357	376	376	376	376	386	386	8%
Annual % Change	0%	5%	8%	8%	5%	5%	0%	0%	0%	3%	0%	
Totals	4,275	4,340	4,370	4,403	4,457	4,489	4,503	4,527	4,557	4,634	4,634	100%
Annual % Change	1%	2%	1%	1%	1%	1%	0%	1%	1%	2%	0%	

(1) District 5 data from Santa Cruz were extracted from District 4 report in years prior to 1995 when the Santa Cruz area was a part of District 4.

(2) In 1995, district boundaries were adjusted to follow county lines.

(3) In 2004, total freeway mileage was not available, so the 2003 mileage was used.

Note: Directional urban freeway miles from the Caltrans Traffic Accident Surveillance and Analysis System (TASAS) highway inventory.

Exhibit 2-4: Congested Directional Miles to Total Directional Miles by District 1994-2004

	1994	1995 ⁽⁴⁾	1996 ⁽⁵⁾	1997 ⁽⁵⁾	1998	1999	2000	2001	2002	2003 ⁽⁶⁾	2004 ⁽⁶⁾
District 3	17%	17%	19%	No statewide report developed	31%	26%	30%	38%	35%	38%	37%
District 4 ⁽¹⁾	21%	25%	27%		30%	31%	36%	35%	34%	31%	36%
District 5 ⁽¹⁾	3%	n/a			8%	7%	18%	17%	18%	23%	23%
District 6	5%	5%			1%	5%	4%	7%	6%	9%	14%
District 7 ⁽²⁾	53%	53%			53%	53%	58%	62%	58%	60%	60%
District 8 ⁽³⁾	26%	19%			17%	18%	31%	23%	24%	20%	19%
District 10					11%	15%	11%	28%	28%	25%	22%
District 11 ⁽³⁾	14%	15%			27%	38%	62%	59%	58%	68%	70%
District 12	50%	46%			57%	79%	71%	68%	62%	55%	49%
Totals	27%	27%			33%	36%	42%	43%	41%	41%	42%

(1) District 5 data from Santa Cruz were extracted from District 4 report in years prior to 1995 when the Santa Cruz area was a part of District 4. No 1995 data are available for District 5.

(2) 2002 District 7 figures reflect more comprehensive coverage.

(3) District 8 began to use automatic freeway detector data on some corridors in 2001. District 11 began to use automatic freeway detector data on some corridors in 1998.

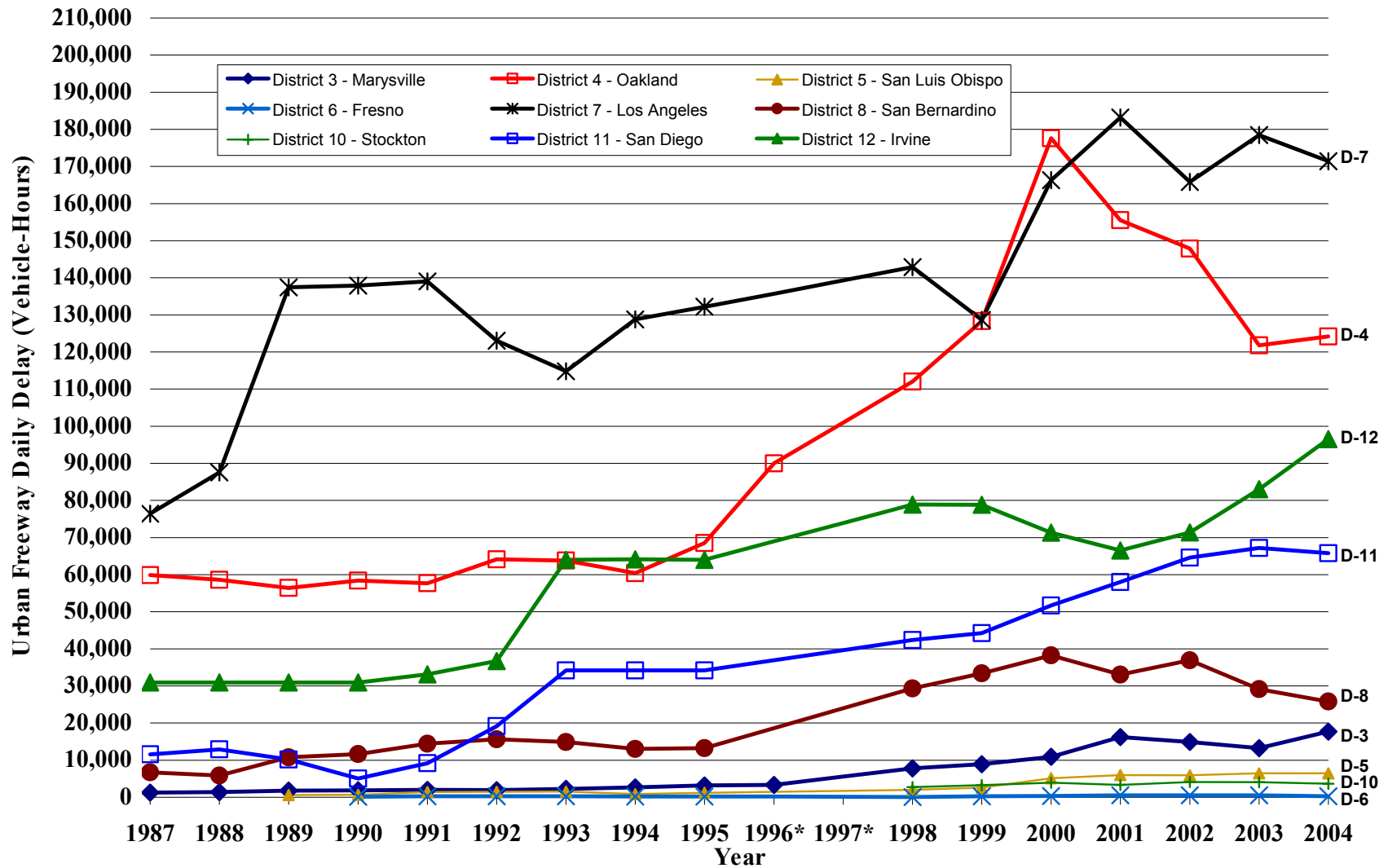
(4) Dramatic changes in percentages may be due in part to changes in "urban" boundaries or in changes in district boundaries. In 1995, district boundaries were adjusted to follow county lines.

(5) No statewide report developed in 1996 and 1997. Some districts developed internal reports in 1996.

(6) Mileage in District 5 is assumed to have not changed between 2002 and 2004 due to lack of data. Some congested segments were also assumed to not have changed in congested mileage in Districts 8 and 12 since data collection was not performed in some areas.

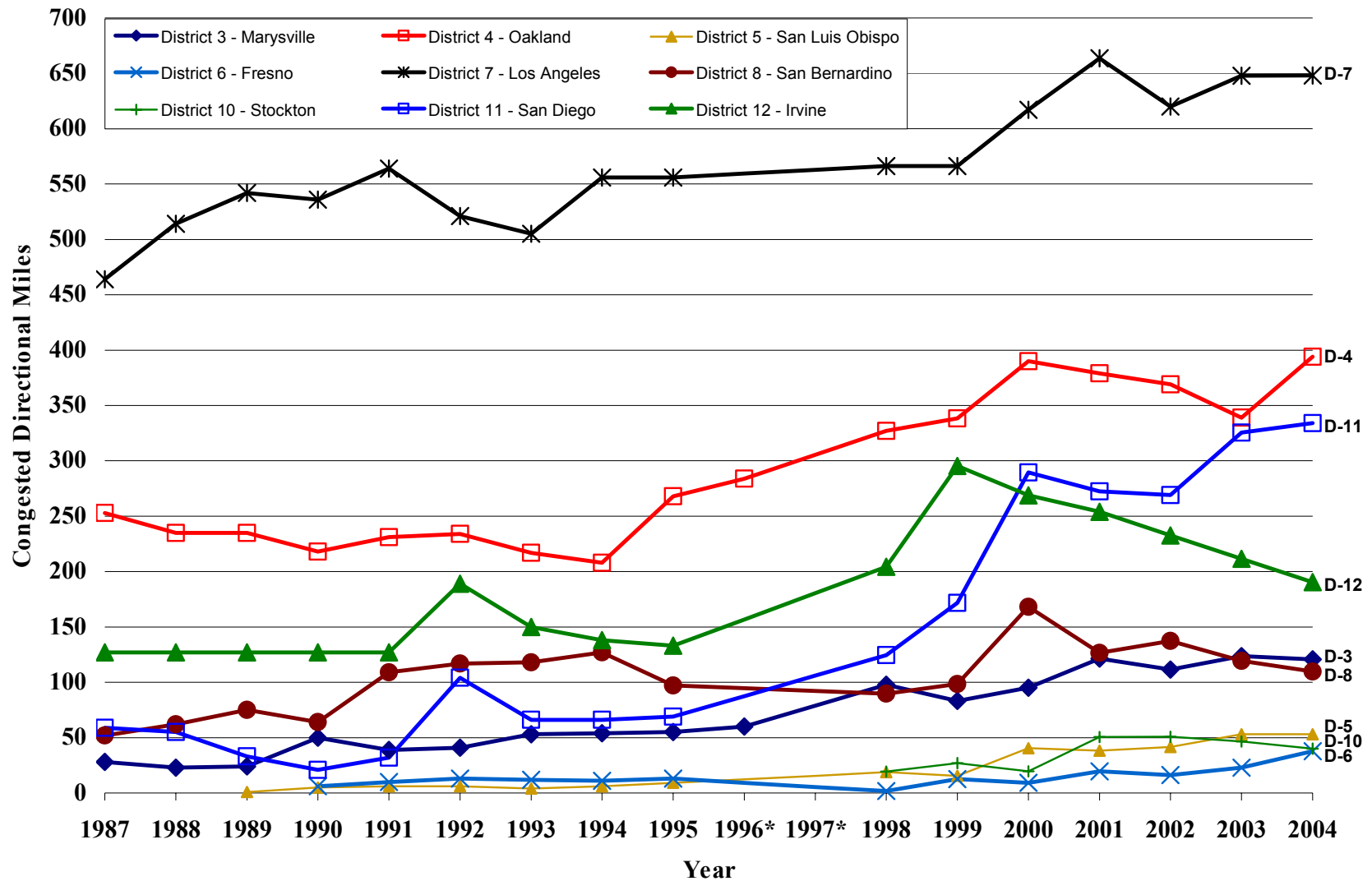
Note: Directional urban freeway miles from the TASAS highway inventory.

Exhibit 2-5: Daily Vehicle-Hours of Delay Trends by District 1987-2004



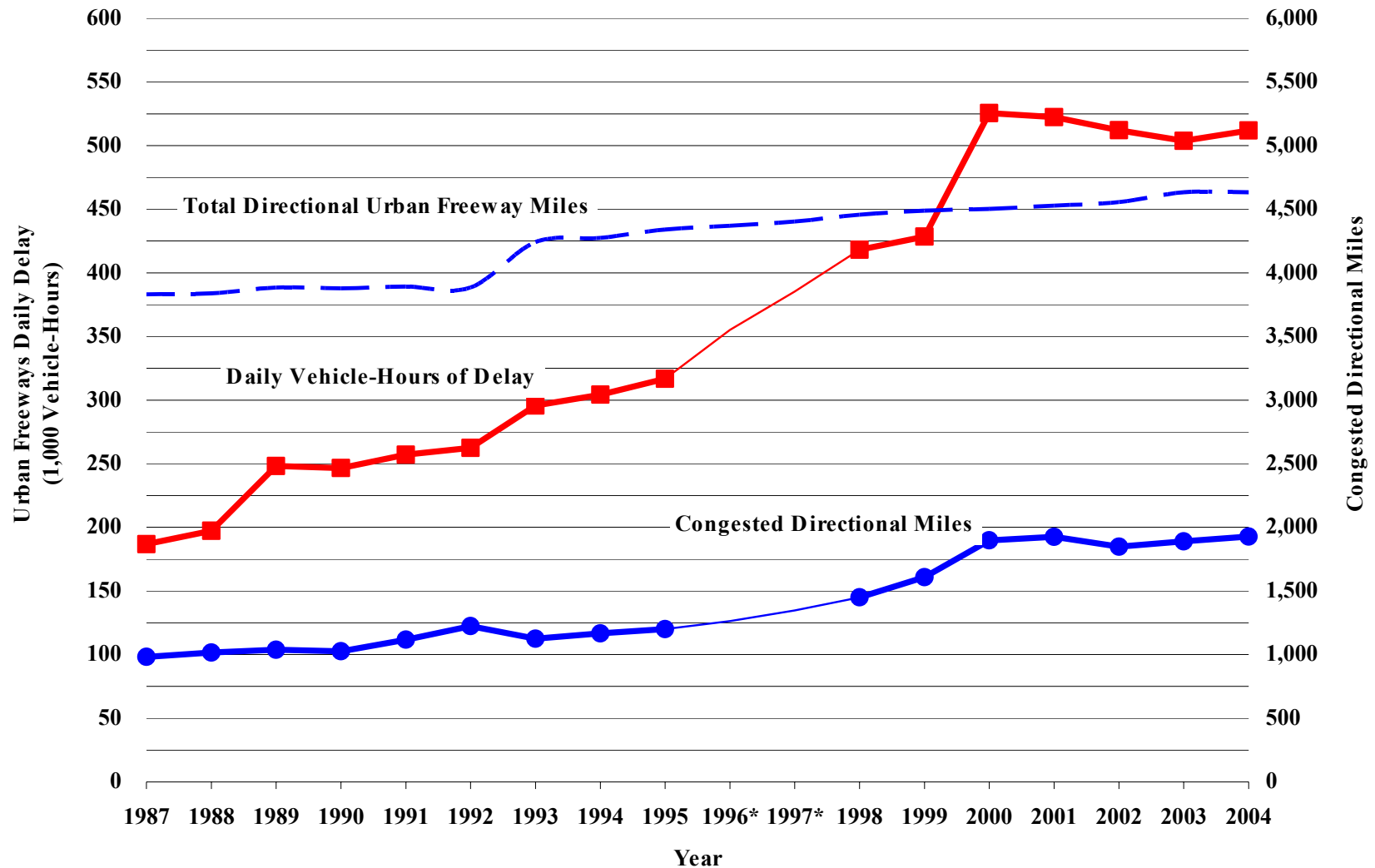
* No statewide report was developed in 1996 and 1997. Internal district data were used where available for these years.
District 7 numbers for 2000 were revised based on an updated analysis.

Exhibit 2-6: Congested Directional Mile Trends by District 1987-2004



* No statewide report was developed in 1996 and 1997. Internal district data were used where available for these years.
District 7 numbers for 2000 were revised based on an updated analysis.

Exhibit 2-7: Statewide Vehicle-Hours of Delay and Congested Directional Miles 1987-2004



* No statewide report was developed in 1996 and 1997. Internal district data were used where available for these years.
 District 7 numbers for 2000 were revised based on an updated analysis.

Exhibit 2-8: Daily Delay and Congested Directional Miles County Rankings 2003-2004

Rank		Caltrans District	County	Daily Vehicle-Hours of Delay		Congested Directional Miles	
2004	2003			2004	2003	2004	2003
1	1	7	Los Angeles	170,965	178,220	639.5	638.4
2	2	12	Orange	96,522	83,002	190.3	211.5
3	3	11	San Diego	65,768	67,163	333.9	325.5
4	4	4	Alameda	50,540	46,300	124.0	98.0
5	6	4	Santa Clara	22,910	24,300	90.0	75.0
6	5	8	Riverside	19,659	22,806	73.0	70.3
7	7	4	Contra Costa	18,520	18,700	75.0	58.0
8	8	3	Sacramento	15,500	11,770	103.7	103.9
9	9	4	San Francisco	8,860	11,200	21.0	23.0
10	10	4	San Mateo	7,800	7,300	32.0	30.0
11	12	4	Marin	7,410	6,200	20.0	20.0
12	11	8	San Bernardino	6,139	6,300	36.7	43.1
13	13	4	Sonoma	5,320	5,200	21.0	23.0
14	14	5	Santa Cruz	4,030	4,030	17.9	17.9
15	15	10	San Joaquin	3,383	3,635	31.7	40.3
16	16	4	Solano	2,830	2,600	11.0	12.0
17	17	5	Santa Barbara	2,110	2,110	25.1	25.1
18	18	3	Placer	1,772	1,398	10.0	9.8
19	22	7	Ventura	473	270	8.5	9.5
20	23	3	El Dorado	306	38	5.0	4.0
21	20	10	Stanislaus	302	429	8.3	6.2
22	19	6	Fresno	292	484	37.9	21.7
23	21	5	Monterey	280	280	5.3	5.3
24	26	3	Yolo	134	20	2.1	6.0
25	24	5	San Luis Obispo	33	33	4.9	4.9
26	25	6	Kern	0	23	0.0	1.3
Totals				511,857	503,811	1,928	1,884

Note: County numbers may not add to total due to rounding.

Exhibit 2-9: 2004 Excess Fuel Consumption, Travel Cost, and Emissions Due to Congestion

District Indicator	3	4	5	6	7	8	10	11	12	Total
Total Daily Delay (Vehicle-Hours) ⁽¹⁾	35,424	248,380	12,907	584	342,876	51,596	7,370	131,535	193,043	1,023,714
Average Vehicle Occupancy ⁽²⁾	1.00	1.10	1.00	1.10	1.10	1.10	1.10	1.00	1.10	
Estimated Daily Person-Hours of Delay ⁽²⁾	35,424	273,218	12,907	642	377,164	56,755	8,107	131,535	212,347	1,108,099
Excess Fuel Consumed per Day (Gallons) ⁽³⁾	60,894	426,965	22,187	1,003	589,404	88,693	12,668	226,109	331,841	1,759,764
Total User Cost per Day (Dollars) ⁽⁴⁾	\$557,307	\$4,206,186	\$203,054	\$9,882	\$5,806,426	\$873,746	\$124,800	\$2,069,373	\$3,269,085	\$17,119,859
Total Emissions per Day (Tons) ⁽³⁾	18	124	6	0.3	171	26	4	66	97	512

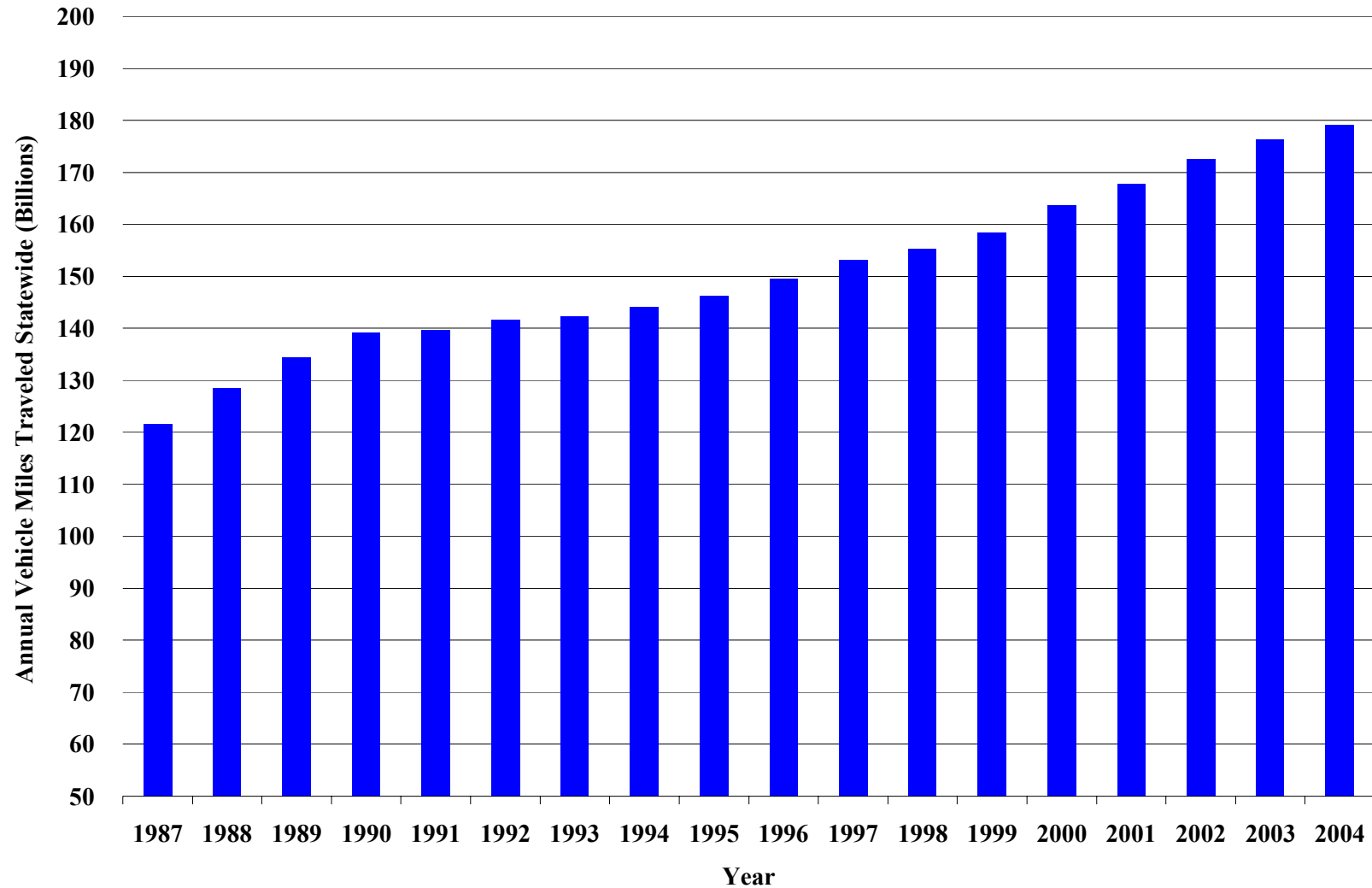
(1) Recurrent congestion is a condition that occurs when operating speeds on the freeway remain below 35 mph for 15 minutes or more on a typical incident-free weekday. Non-recurrent congestion is congestion caused by incidents and special events, and is estimated to be equal to recurrent congestion. Therefore, total daily delay is double the non-recurrent congestion reported in the HICOMP report.

(2) Average Vehicle Occupancy (AVO) estimates are used to calculate the daily person-hours of delay (Total Daily Delay x AVO). The person-hours of daily delay estimates are then used to calculate the total user cost per day. AVOs used in the HICOMP are the "home-to-work" trip estimates from the 2000-2001 California Statewide Household Travel Survey. Caltrans, June 2002.

(3) Fuel Efficient Traffic Signal Management Evaluation (Institute of Transportation Studies): 1,000 vehicle-hours of delay results in 1,719 gallons of wasted fuel and 1/2 ton of emissions.

(4) Total user cost includes cost of travel time and cost of excess fuel. The average cost of travel time per person-hour of delay in 2004 is estimated to be \$12.02. This figure is based on the average auto and truck costs of travel from the California Lifecycle Benefit/Cost Analysis Model. The cost of fuel is estimated at \$2.16 per gallon, the average monthly price (weighted by monthly "vehicle miles traveled" estimates from Caltrans) for regular unleaded gasoline as reported by the California State Automobile Association (CSAA) monthly gas survey for the year 2004.

Exhibit 2-10: California State Highway Vehicle Miles Traveled (VMT) 1987-2004



Source: Division of Traffic Operations, Traffic and Vehicle Data Systems Unit (<http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/monthly/VMTHIST1.pdf>)

3. District Level Findings and Analysis

This chapter presents the 2004 findings by Caltrans districts. The results are presented in three formats: 1) a district summary table presenting total district-wide delay, cdm, and county sub-totals; 2) a chart showing the district trends over time for delay and congested miles; and 3) two maps showing the location and duration of freeway segments where congestion was measured. The first map shows congested locations for the A.M. peak commute period, and the second map shows the results for the P.M. peak commute period.

3.1 District 3: Sacramento Area

Exhibit 3-1 summarizes weekday recurrent congestion in District 3 during 2004 compared to 2003. Exhibit 3-2 presents trends in vhdpd and cdm for the district. Exhibits 3-3 and 3-4 are maps showing the location and duration of A.M. and P.M. period congestion.

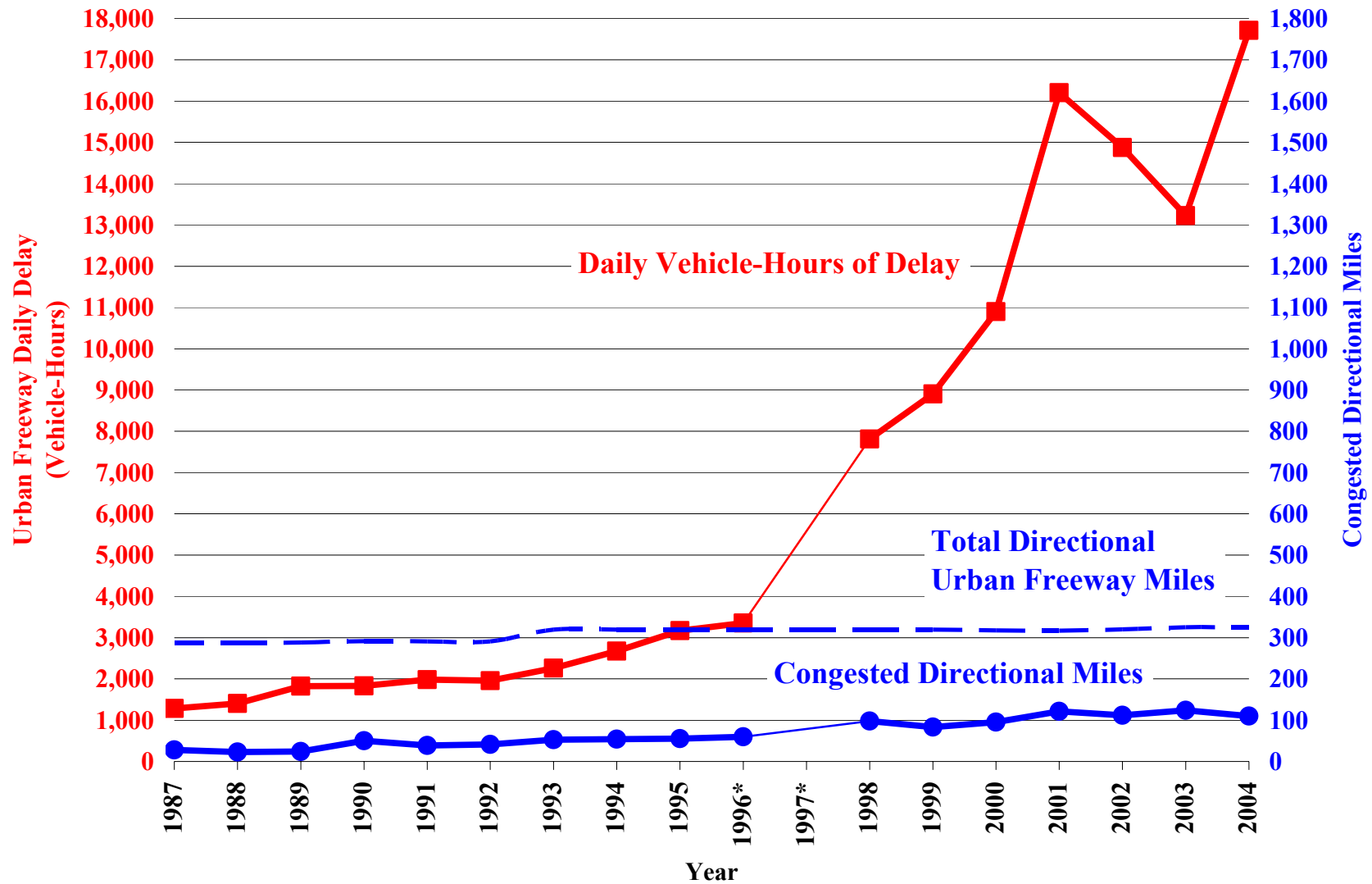
Both the 2003 and 2004 data used in this statewide congestion monitoring report are based on the fall probe vehicle data collection efforts. Prior to 1998, delay estimates were based on both spring and fall probe vehicle data.

In 2004, the total vhdpd were 17,712, compared to 13,226 reported for 2003 (a 34 percent increase). CDM were nearly 121 miles in 2004, a 2 percent decrease over the 124 miles reported in 2003.

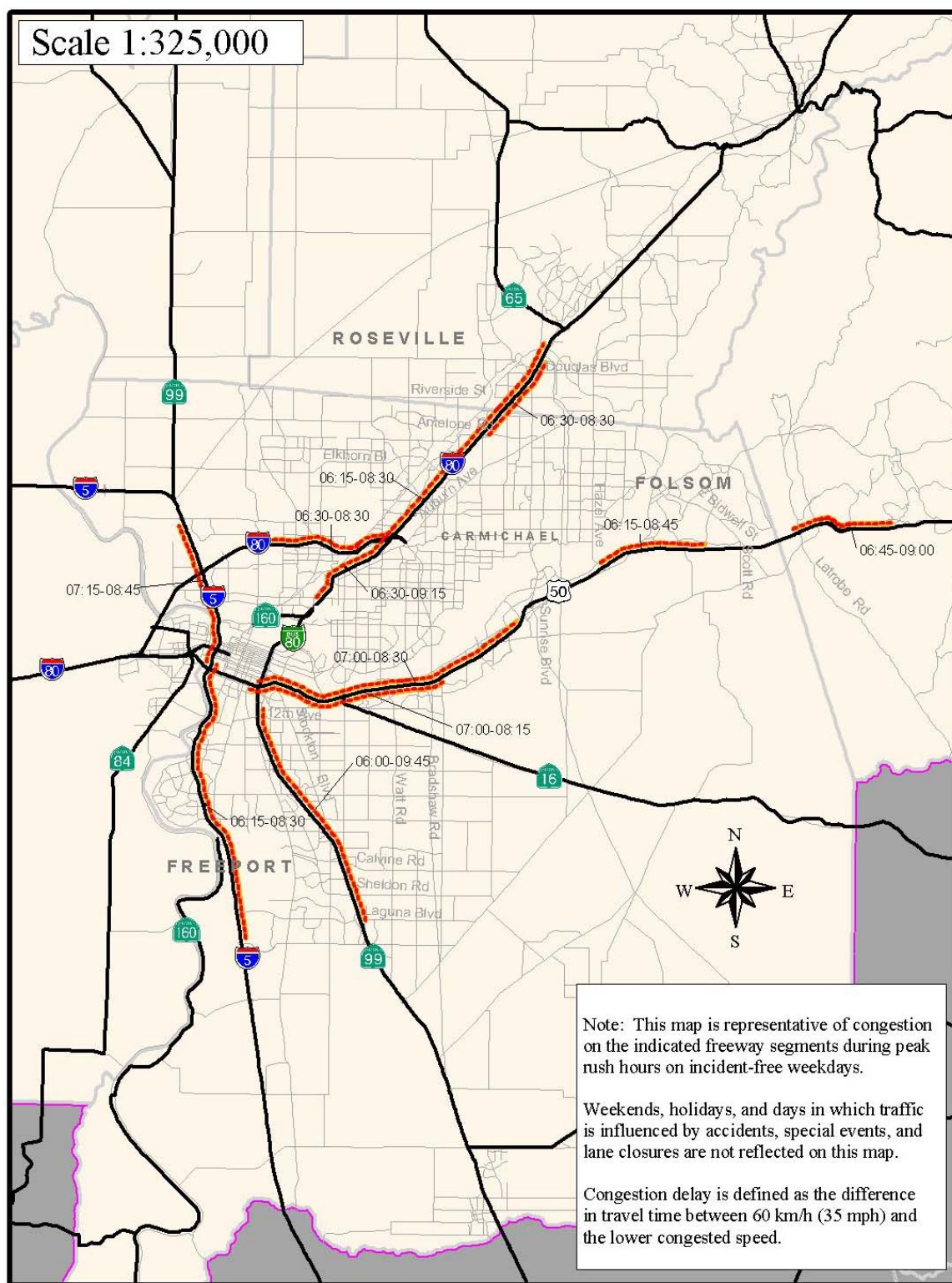
Exhibit 3-1: District 3 Highway Congestion Summary

District 3	2003	2004	Percent Change 2003-2004	Percent of Statewide 2004
Daily Vehicle-Hours of Delay	13,226	17,712	34%	3%
El Dorado	38	306	705%	
Placer	1,398	1,772	27%	
Sacramento	11,770	15,500	32%	
Yolo	20	134	570%	
Congested Directional Miles	123.7	120.8	-2%	6%
El Dorado	4.0	5.0	25%	
Placer	9.8	10.0	2%	
Sacramento	103.9	103.7	0%	
Yolo	6.0	2.1	-65%	
Total Urban Area Freeway Directional Miles	325.4	325.4		
Congested Miles/ Total Urban Freeway Miles	38%	37%		

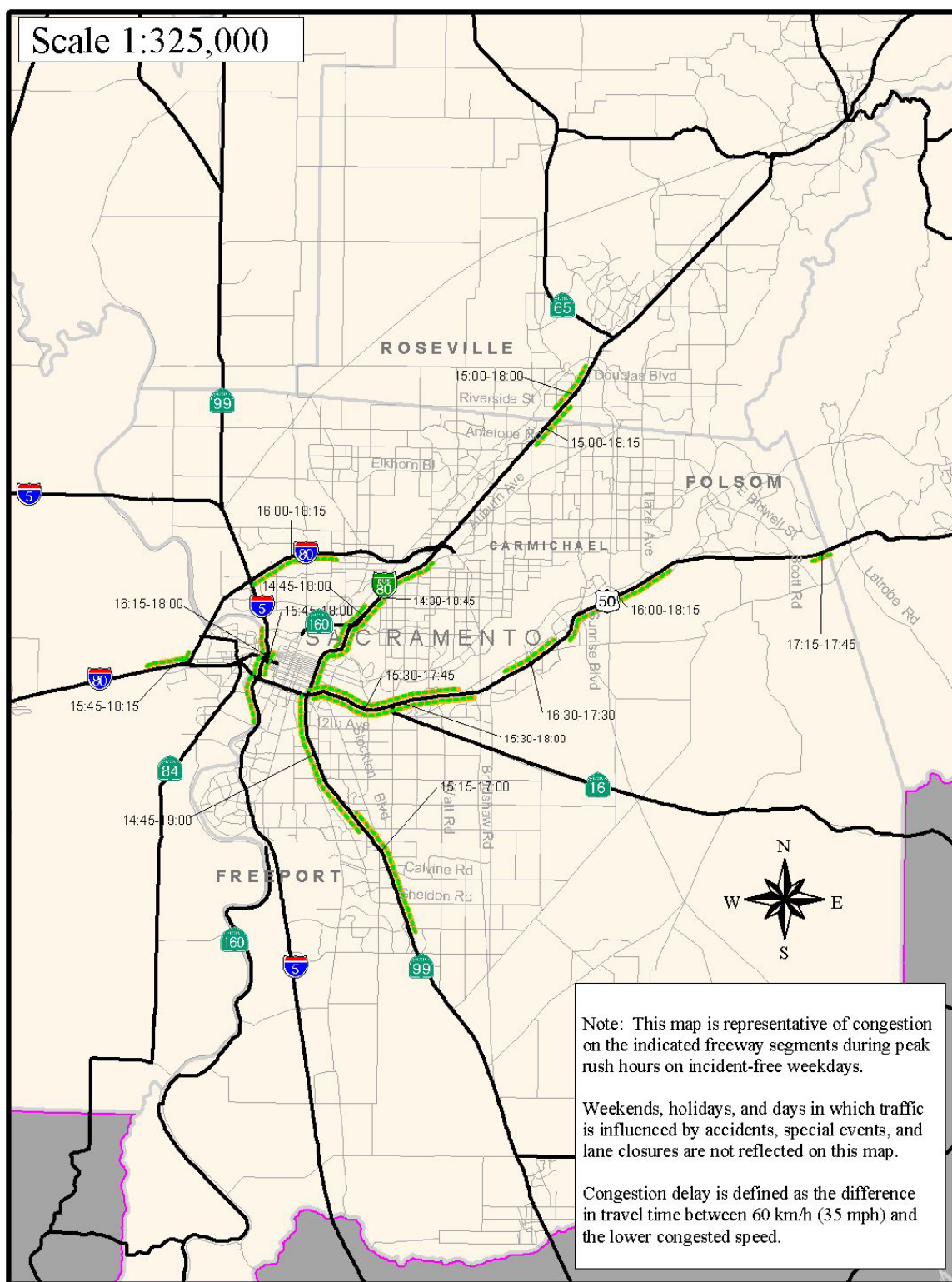
Exhibit 3-2: District 3 Congestion Trends 1987-2004



* No statewide report developed in 1996 or 1997. District 3 developed an internal report in 1996.



**EXHIBIT 3-3
DISTRICT 3
SACRAMENTO AREA
2004 A.M. CONGESTION MAP**



**EXHIBIT 3-4
DISTRICT 3
SACRAMENTO AREA
2004 P.M. CONGESTION MAP**

3.2 District 4: San Francisco Bay Area

Exhibit 3-5 summarizes weekday recurrent congestion in District 4 during 2004 compared to 2003. Exhibit 3-6 presents trends in vhdpd and cdm for the district. Exhibits 3-7 and 3-8 are maps showing the location and duration of A.M. and P.M. period congestion.

District 4 collects data in both the spring and fall seasons for the statewide HICOMP report. District 4's 70 most congested locations were collected using GPS equipped floating cars during the spring and fall season of 2004 by consultants hired by Caltrans' regional partner, the Metropolitan Transportation Commission (MTC). Year 2004 delay estimates were conducted by MTC's consultant with Caltrans' guidance and review.

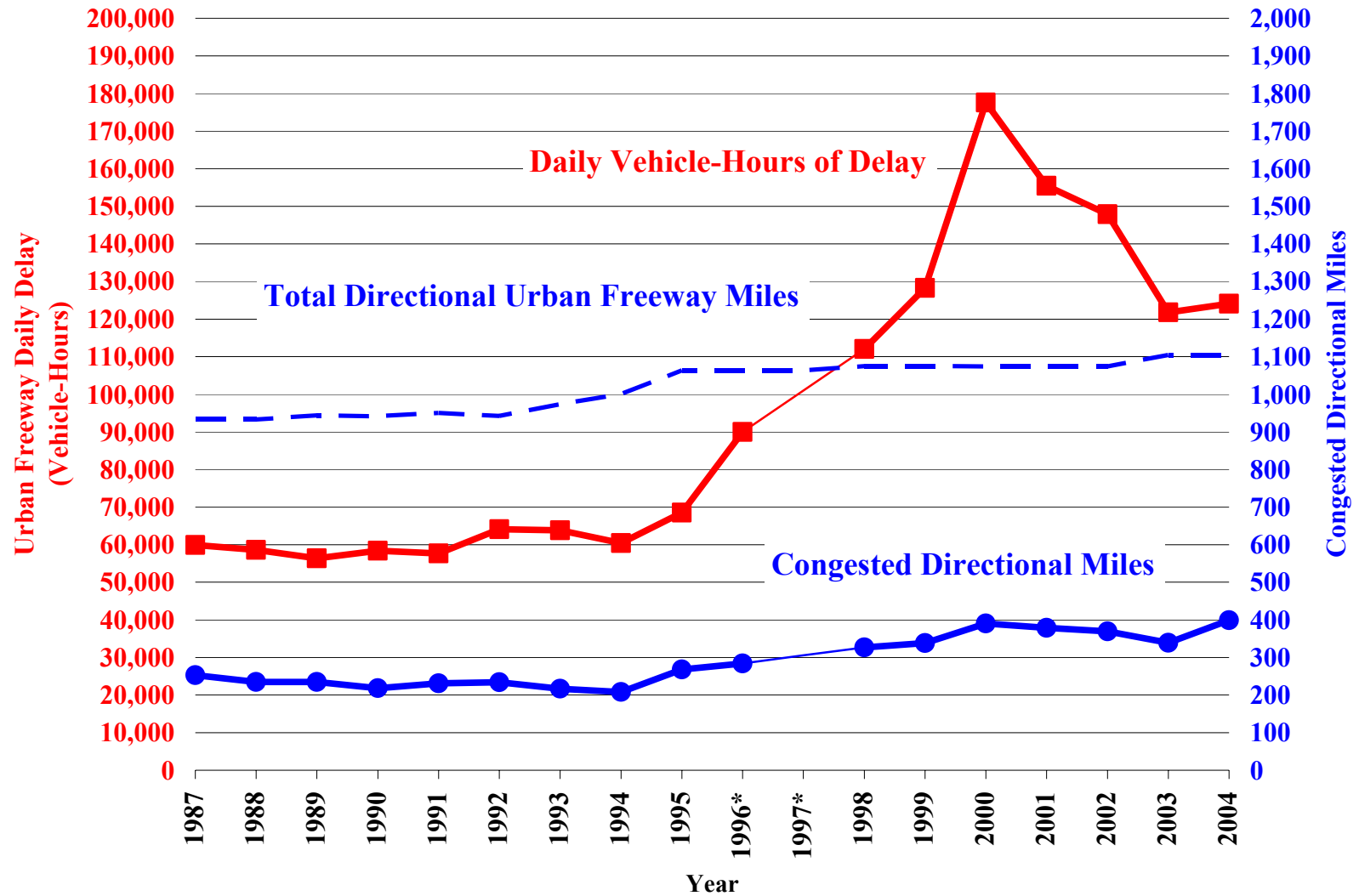
In 2004, the total vhdpd were 124,190 compared to 121,800 reported for 2003 (a 2 percent increase). CDM were 394 miles in 2004, up 16 percent from 2003.

Exhibit 3-5: District 4 Highway Congestion Summary

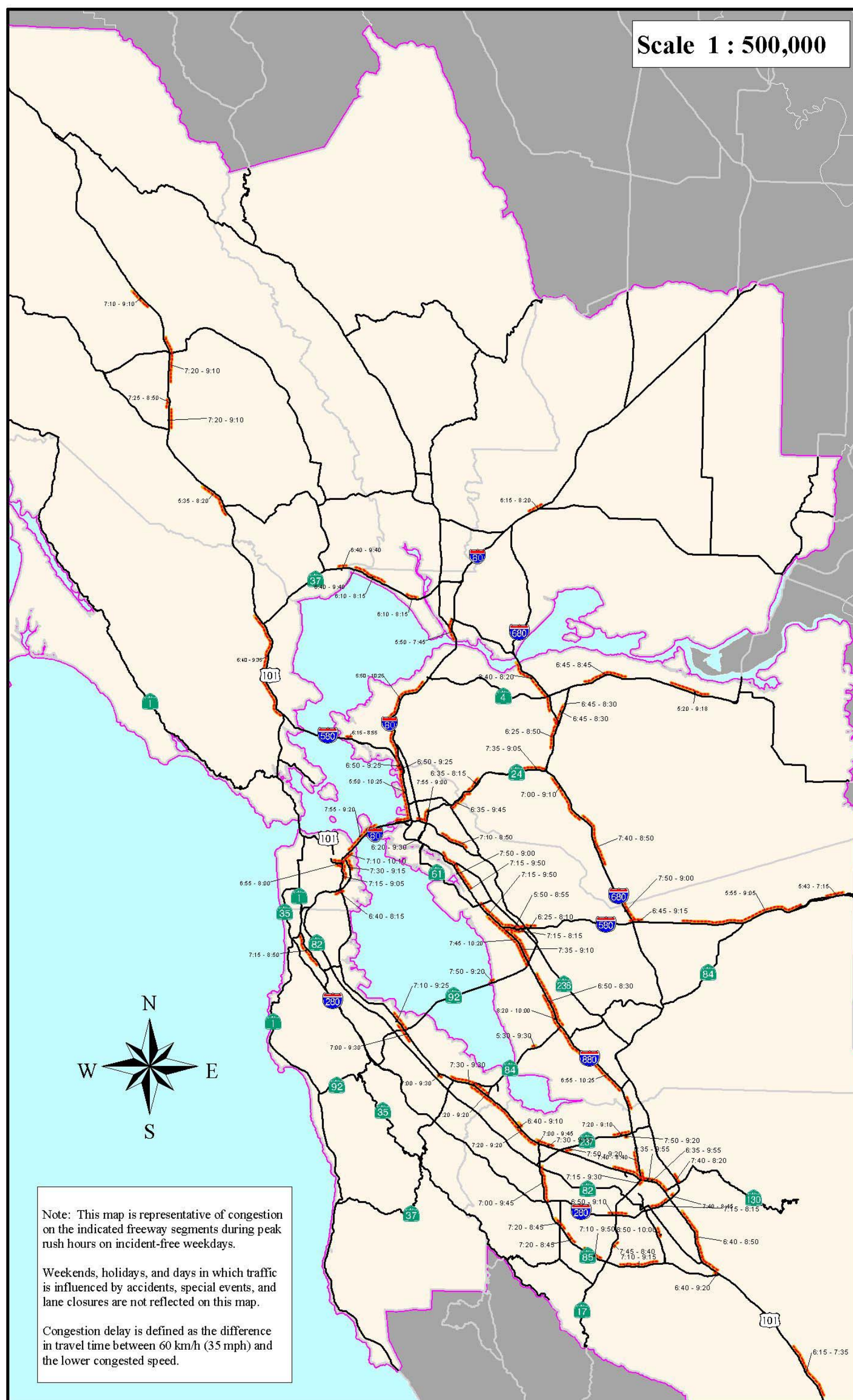
District 4	2003	2004	Percent Change 2003-2004	Percent of Statewide 2004
Daily Vehicle-Hours of Delay	121,800	124,190	2%	24%
Alameda	46,300	50,540	9%	
Contra Costa	18,700	18,520	-1%	
Marin	6,200	7,410	20%	
Napa	0	0	n/a	
San Francisco	11,200	8,860	-21%	
San Mateo	7,300	7,800	7%	
Santa Clara	24,300	22,910	-6%	
Solano	2,600	2,830	9%	
Sonoma	5,200	5,320	2%	
Congested Directional Miles	339.0	394.0	16%	20%
Alameda	98.0	124.0	27%	
Contra Costa	58.0	75.0	29%	
Marin	20.0	20.0	0%	
Napa	0.0	0.0	n/a	
San Francisco	23.0	21.0	-9%	
San Mateo	30.0	32.0	7%	
Santa Clara	75.0	90.0	20%	
Solano	12.0	11.0	-8%	
Sonoma	23.0	21.0	-9%	
Total Urban Area Freeway Directional Miles	1,104.3	1,104.3		
Congested Miles/Total Urban Freeway Miles	31%	36%		

Note: County numbers may not sum to district totals due to rounding.

Exhibit 3-6: District 4 Congestion Trends 1987-2004



* No statewide report in 1996 or 1997. District 4 developed an internal report in 1996.



**EXHIBIT 3-7
DISTRICT 4
SAN FRANCISCO BAY AREA
2004 A.M. CONGESTION MAP**



**EXHIBIT 3-8
DISTRICT 4
SAN FRANCISCO BAY AREA
2004 P.M. CONGESTION MAP**

3.3 District 5: Central Coast Area

Exhibit 3-9 summarizes weekday recurrent congestion in District 5 during 2004 compared to 2003. Exhibit 3-10 presents trends in vhdpd and cdm for the district. Exhibits 3-11 and 3-12 are maps showing the location and duration of A.M. and P.M. period congestion.

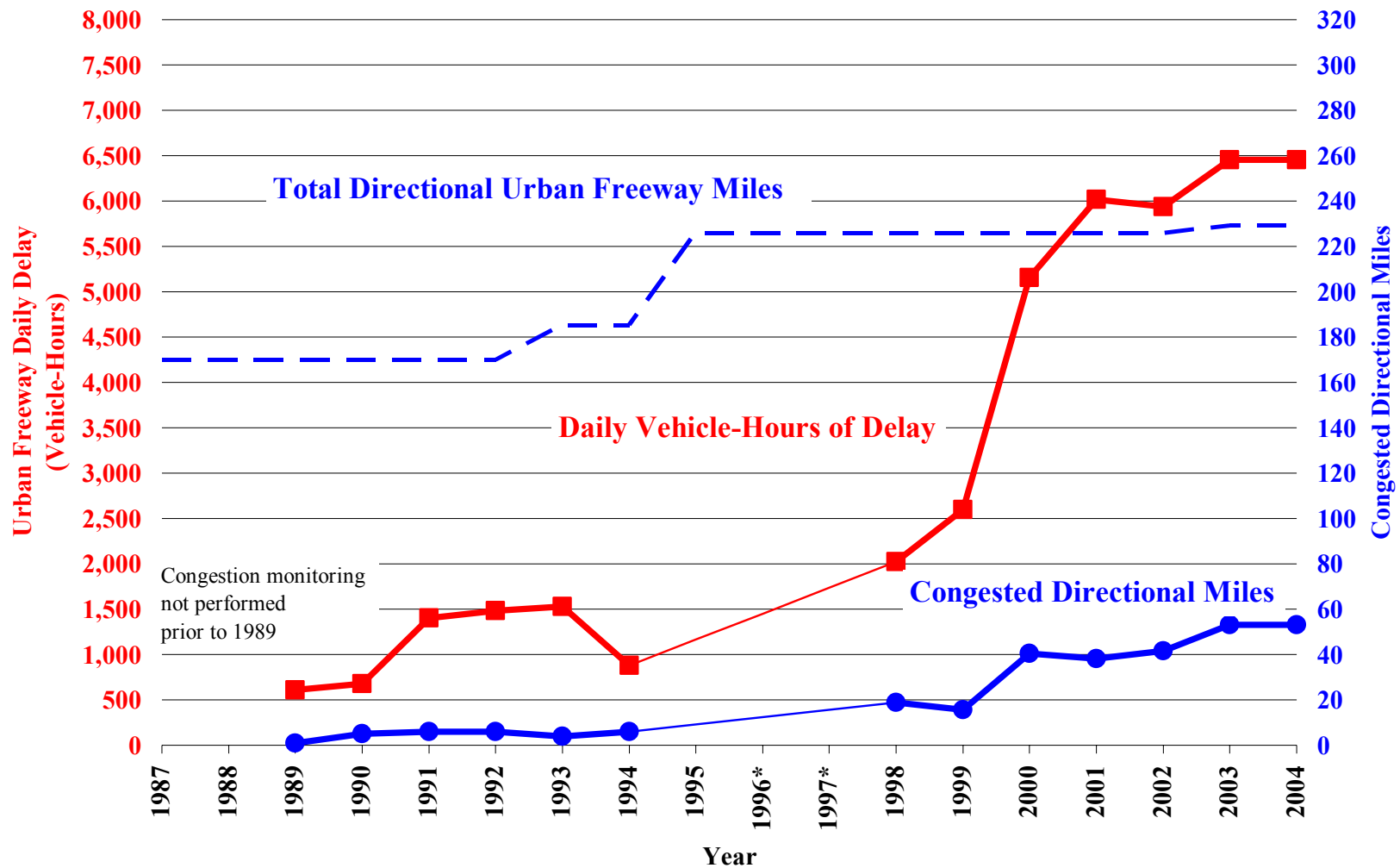
In 2004, the total vhdpd were assumed to be 6,453 hours, the same as in 2003 since no additional data collection was performed. CDM were assumed to be around 53 miles in 2004, the same as in 2003.

Exhibit 3-9: District 5 Highway Congestion Summary

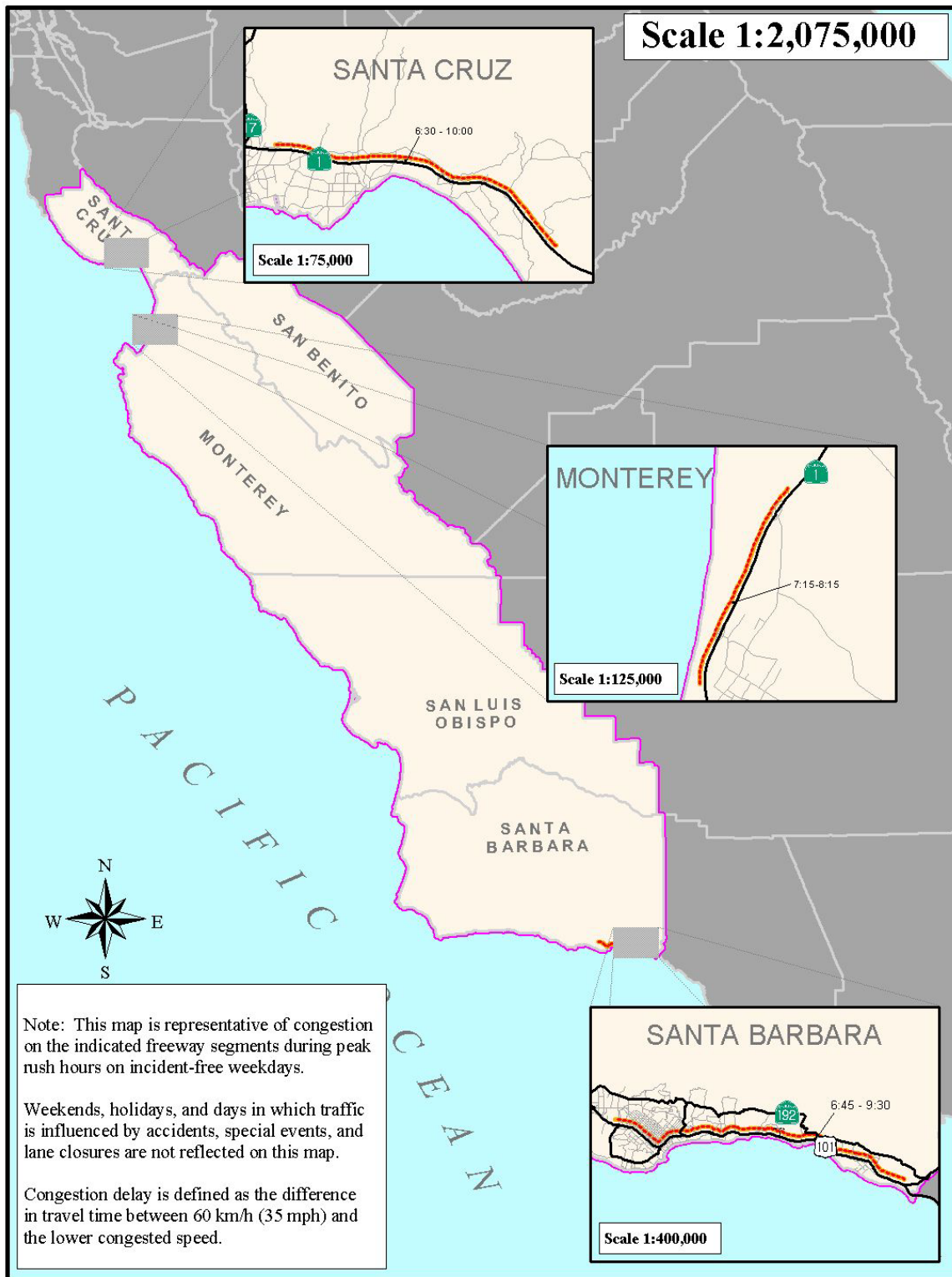
District 5	2003*	2004*	Percent Change 2003-2004	Percent of Statewide 2004
Daily Vehicle-Hours of Delay	6,453	6,453	0%	1%
Monterey	280	280	0%	
San Luis Obispo	33	33	0%	
Santa Barbara	2,110	2,110	0%	
Santa Cruz	4,030	4,030	0%	
Congested Directional Miles	53.1	53.1	0%	3%
Monterey	5.3	5.3	0%	
San Luis Obispo	4.9	4.9	0%	
Santa Barbara	25.1	25.1	0%	
Santa Cruz	17.9	17.9	0%	
Total Urban Area Freeway Directional Miles	229.1	229.1		
Congested Miles/Total Urban Freeway Miles	23%	23%		

* Daily vehicle-hours of delay and congested directional miles in 2003 and 2004 were estimated.

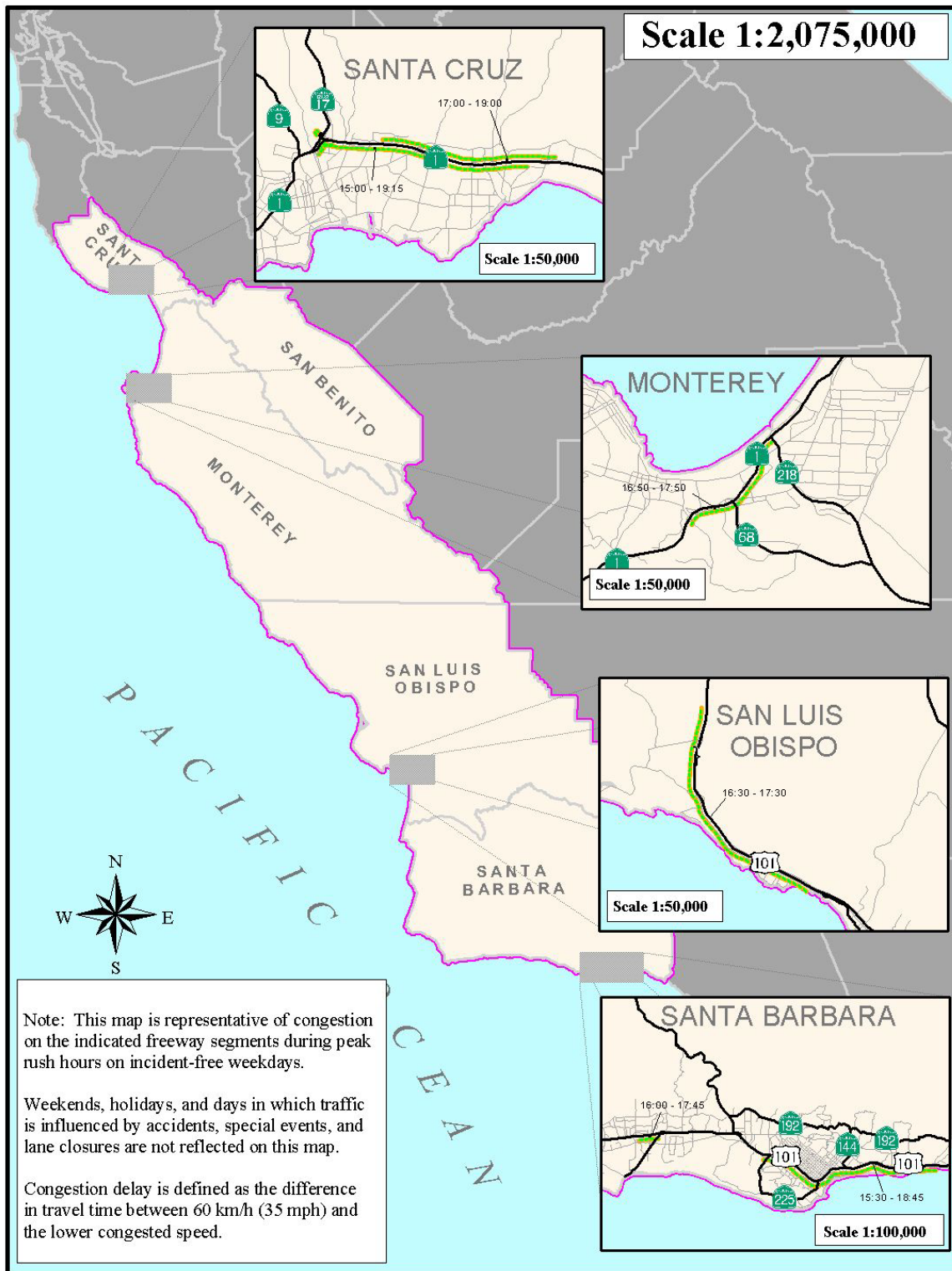
Exhibit 3-10: District 5 Congestion Trends 1989-2004



* No statewide report developed in 1996 or 1997.



**EXHIBIT 3-11
DISTRICT 5
CENTRAL COAST AREA
2004 A.M. CONGESTION MAP**



**EXHIBIT 3-12
DISTRICT 5
CENTRAL COAST AREA
2004 P.M. CONGESTION MAP**

3.4 District 6: Fresno Area

Exhibit 3-13 summarizes weekday recurrent congestion in District 6 during 2004 compared to 2003. Exhibit 3-14 presents trends in vhdpd and cdm for the district. Exhibits 3-15 and 3-16 are maps showing the location and duration of A.M. and P.M. period congestion.

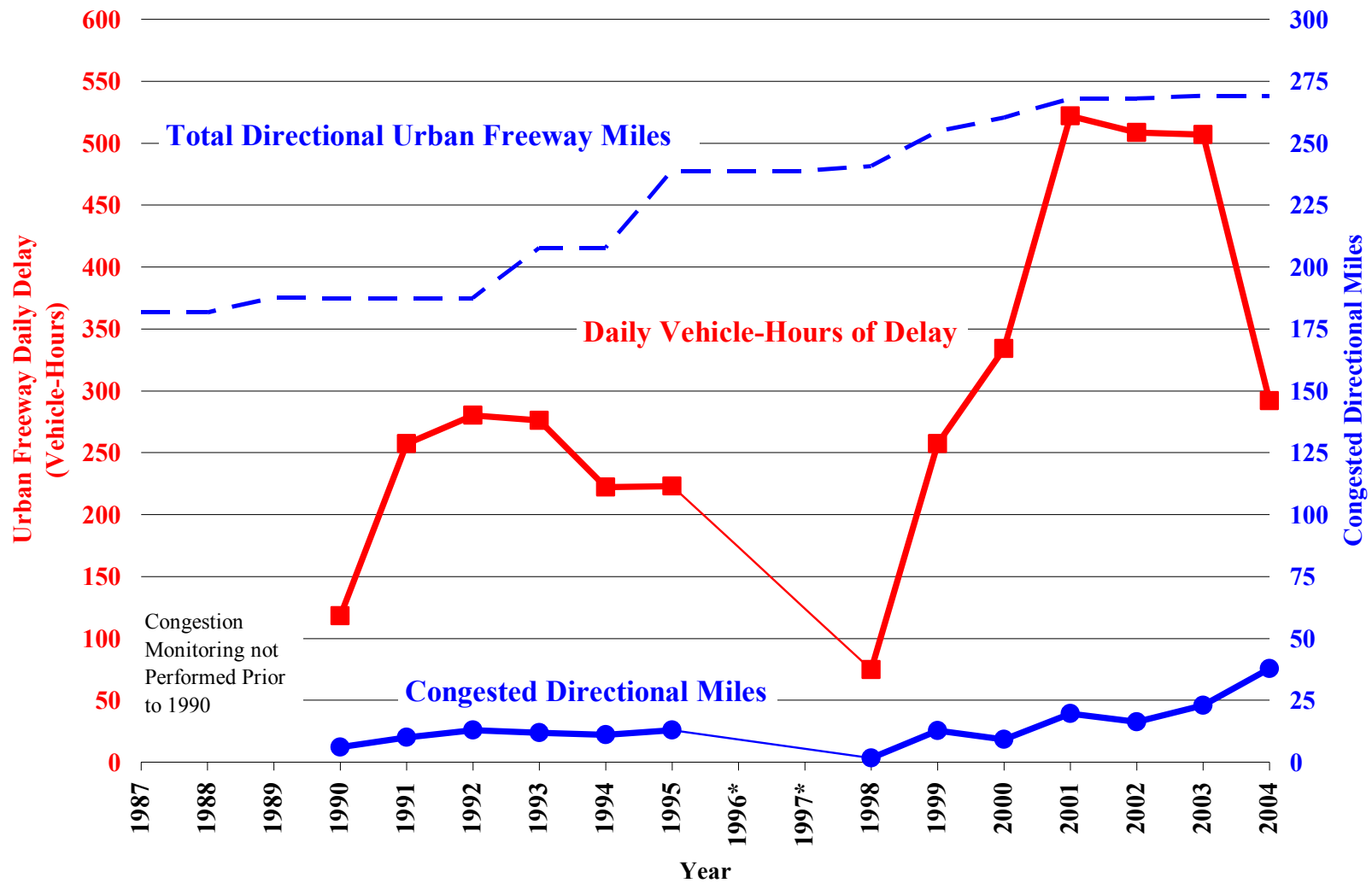
The 2003 and 2004 District 6 results in this report are based on probe vehicle data collected in both the fall and spring seasons. Between 1998 and 2001, delay estimates were based on fall probe vehicle data only.

In 2004, the total vhdpd were 292 compared to the 507 hours reported for 2003. CDM were almost 40 miles in 2004, a 17-mile increase from the 23 miles reported in 2003. District 6's vhdpd and cdm numbers were relatively small to begin with. Therefore, any small change for 2004 may translate to large percentage increases or decreases.

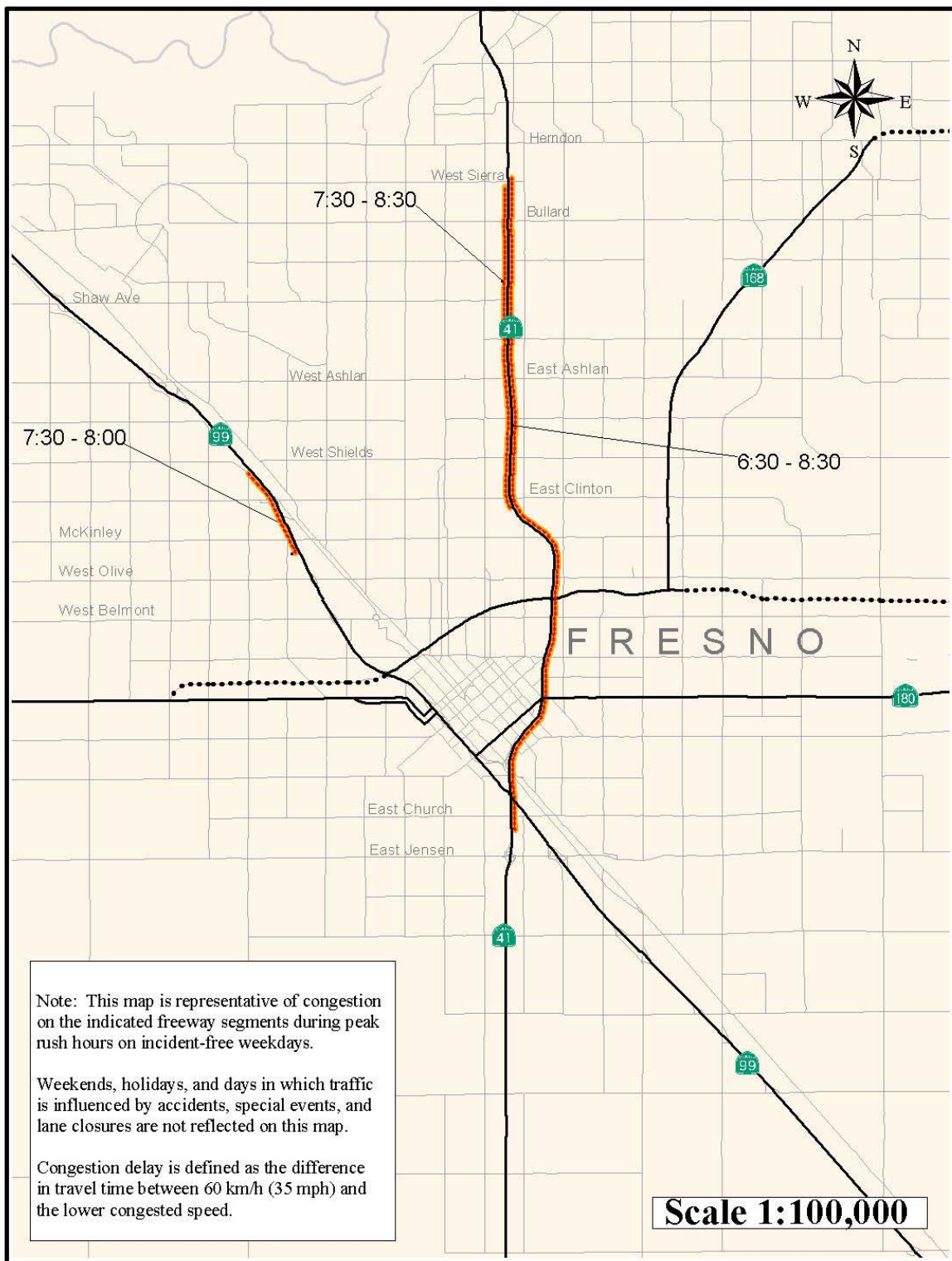
Exhibit 3-13: District 6 Highway Congestion Summary

District 6	2003	2004	Percent Change 2003-2004	Percent of Statewide 2004
Daily Vehicle-Hours of Delay	507	292	-42%	0%
Fresno Kern	484 23	292 0	-40% -100%	
Congested Directional Miles	23.0	37.9	65%	2%
Fresno Kern	21.7 1.3	37.9 0.0	75% -100%	
Total Urban Area Freeway Directional Miles	269.1	269.1		
Congested Miles/Total Urban Freeway Miles	9%	14%		

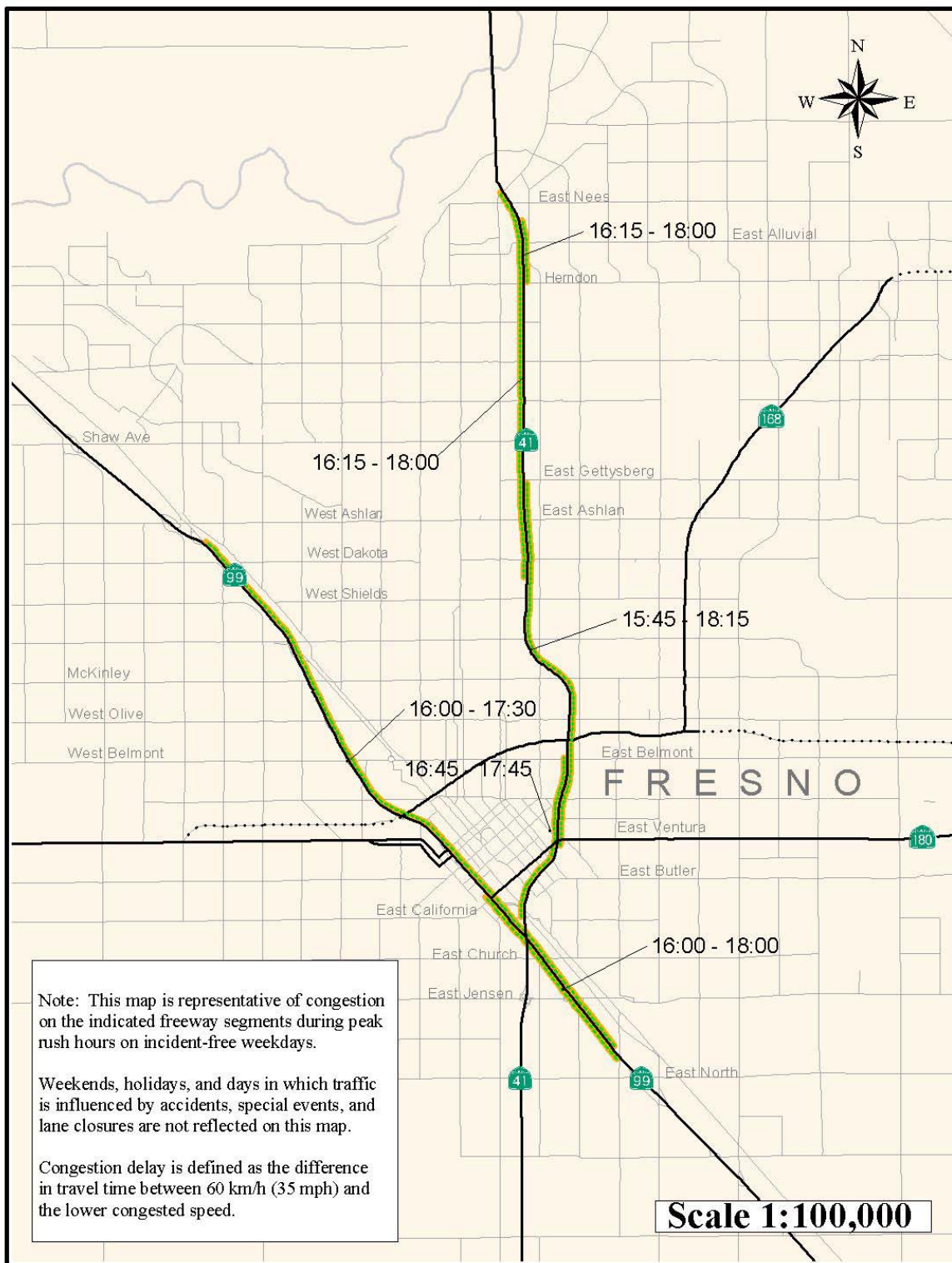
Exhibit 3-14: District 6 Congestion Trends 1990-2004



* No statewide report developed in 1996 or 1997.



**EXHIBIT 3-15
DISTRICT 6
FRESNO AREA
2004 A.M. CONGESTION MAP**



**EXHIBIT 3-16
DISTRICT 6
FRESNO AREA
2004 P.M. CONGESTION MAP**

3.5 District 7: Los Angeles-Ventura Area

Exhibit 3-17 summarizes weekday recurrent congestion in District 7 during 2004 compared to 2003. Exhibit 3-18 presents trends in vhdpd and cdm for the district. Exhibits 3-19 and 3-20 are maps showing the location and duration of A.M. and P.M. period congestion.

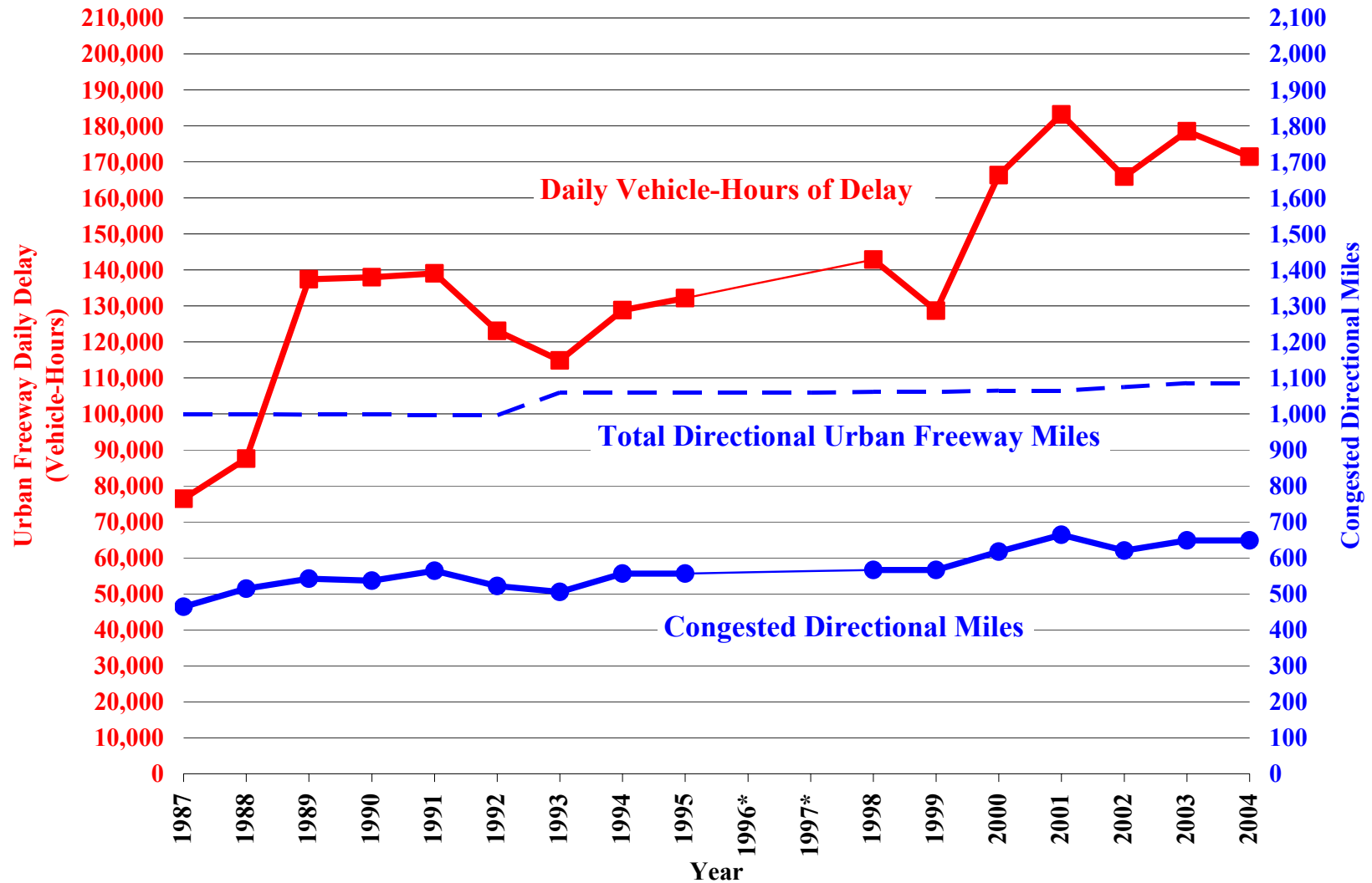
Both the 2003 and 2004 data used in this statewide congestion monitoring report are based on fall data collection efforts only. Prior to 1998, delay estimates were based on both spring and fall automatically collected detector data.

In 2004, the total vhdpd were 171,438 compared to 178,491 hours reported for 2003 (a 4 percent decrease). CDM remained at 648 miles in 2004, as it had in 2003.

Exhibit 3-17: District 7 Highway Congestion Summary

District 7	2003	2004	Percent Change 2003-2004	Percent of Statewide 2004
Daily Vehicle-Hours of Delay	178,491	171,438	-4%	33%
Los Angeles	178,220	170,965	-4%	
Ventura	270	473	75%	
Congested Directional Miles	647.9	648.0	0%	34%
Los Angeles	638.4	639.5	0%	
Ventura	9.5	8.5	-11%	
Total Urban Area Freeway Directional Miles	1,084.8	1,084.8		
Congested Miles/Total Urban Freeway Miles	60%	60%		

Exhibit 3-18: District 7 Congestion Trends 1987-2004



* No statewide report developed in 1996 or 1997.



3.6 District 8: San Bernardino-Riverside Area

Exhibit 3-21 summarizes weekday recurrent congestion in District 8 during 2004 compared to 2003. Exhibit 3-22 presents trends in vhdpd and cdm for the district. Exhibits 3-23 and 3-24 are maps showing the location and duration of A.M. and P.M. period congestion.

The 2004 data used in this congestion monitoring report are based in large part on spring 2005 data collected by probe vehicles. In 2003, no probe vehicle data were collected because of resource constraints. As a result, the results in 2003 were in large part estimated. However, based on the 2004 results, the 2003 data that had been estimated were adjusted as needed.

Prior to 1998, delay estimates were based on both spring and fall probe vehicle data. Beginning in 2001, District 8 began to use fall automatically collected detector data to estimate delay for some route segments. Other segments continued to be monitored using probe vehicles.

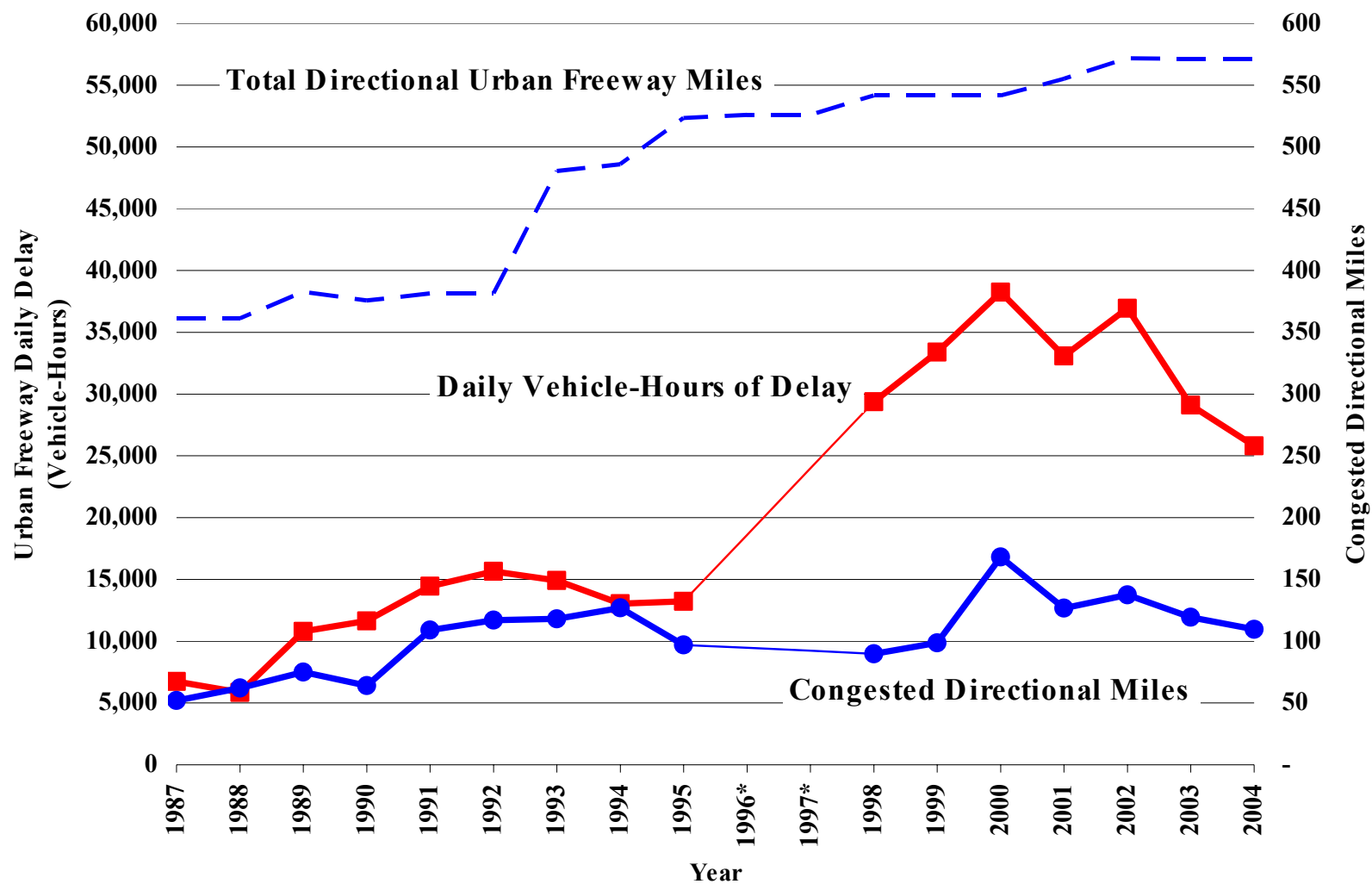
In 2004, the total vhdpd were 25,798 hours compared to an adjusted 29,105 hours reported for 2003 (a decrease of 11 percent). CDM decreased to 109.7 in 2004 compared to 113.4 in 2003 (a decrease of 3 percent).

Exhibit 3-21: District 8 Highway Congestion Summary

District 8	2003*	2004*	Percent Change 2003-2004	Percent of Statewide 2004
Daily Vehicle-Hours of Delay	29,105	25,798	-11%	5%
Riverside	22,806	19,659	-14%	
San Bernardino	6,300	6,139	-3%	
Congested Directional Miles	113.4	109.7	-3%	6%
Riverside	70.3	73.0	4%	
San Bernardino	43.1	36.7	-15%	
Total Urban Area Freeway Directional Miles	571.6	571.6		
Congested Miles/Total Urban Freeway Miles	20%	19%		

* Daily vehicle-hours of delay in 2003 and 2004 were estimated for some segments. Congested directional miles assumed to not have changed between 2003 and 2004 for those segments where no data collection was performed.

Exhibit 3-22: District 8 Congestion Trends 1987-2004



* No statewide report developed in 1996 or 1997.

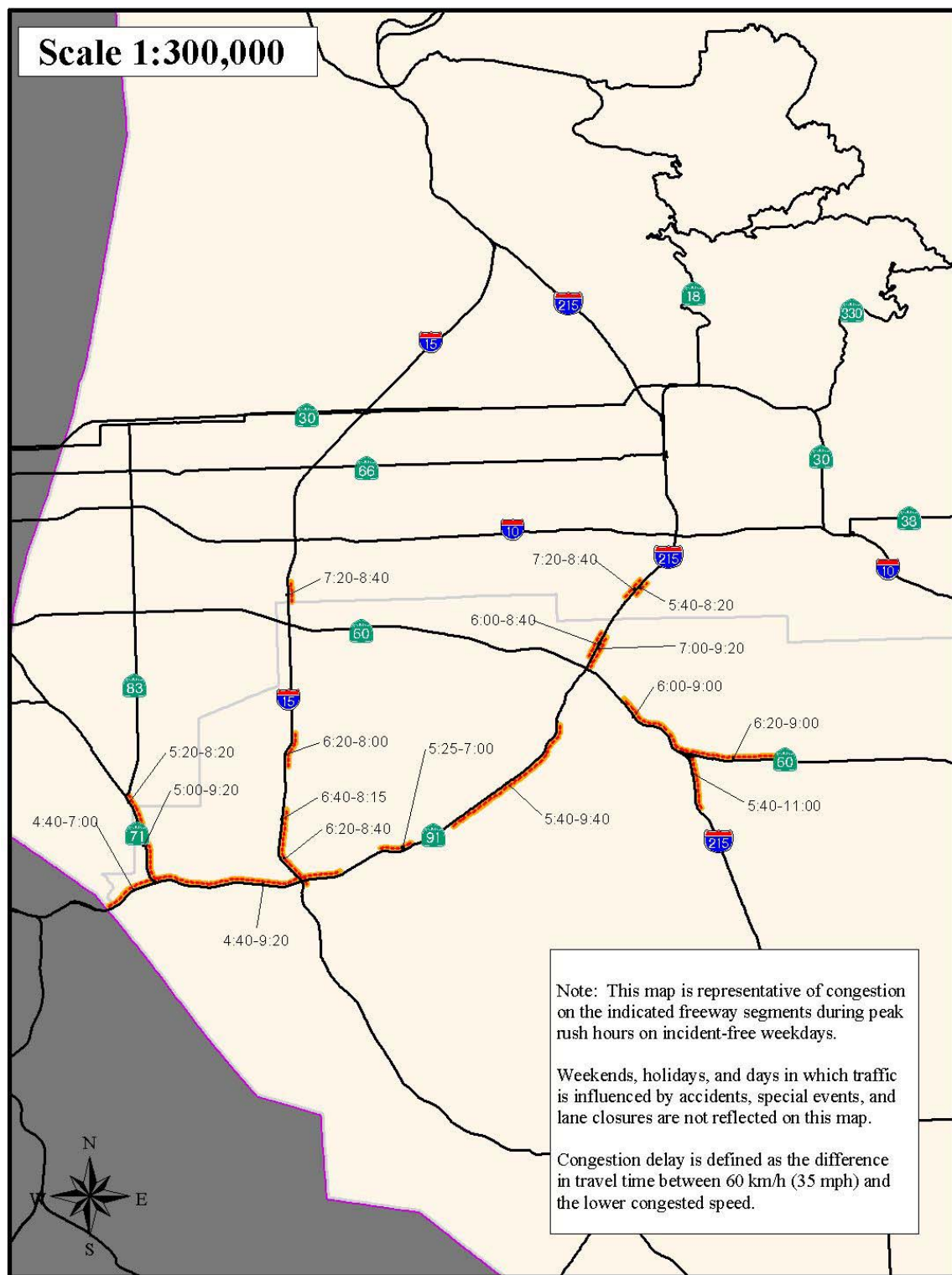


EXHIBIT 3-23
DISTRICT 8
SAN BERNARDINO-RIVERSIDE AREA
2004 A.M. CONGESTION MAP

3.7 District 10: Stockton Area

Exhibit 3-25 summarizes weekday recurrent congestion in District 10 during 2004 compared to 2003. Exhibit 3-26 presents trends in vhdpd and cdm for the district. Exhibits 3-27 and 3-28 are maps showing the location and duration of A.M. and P.M. period congestion.

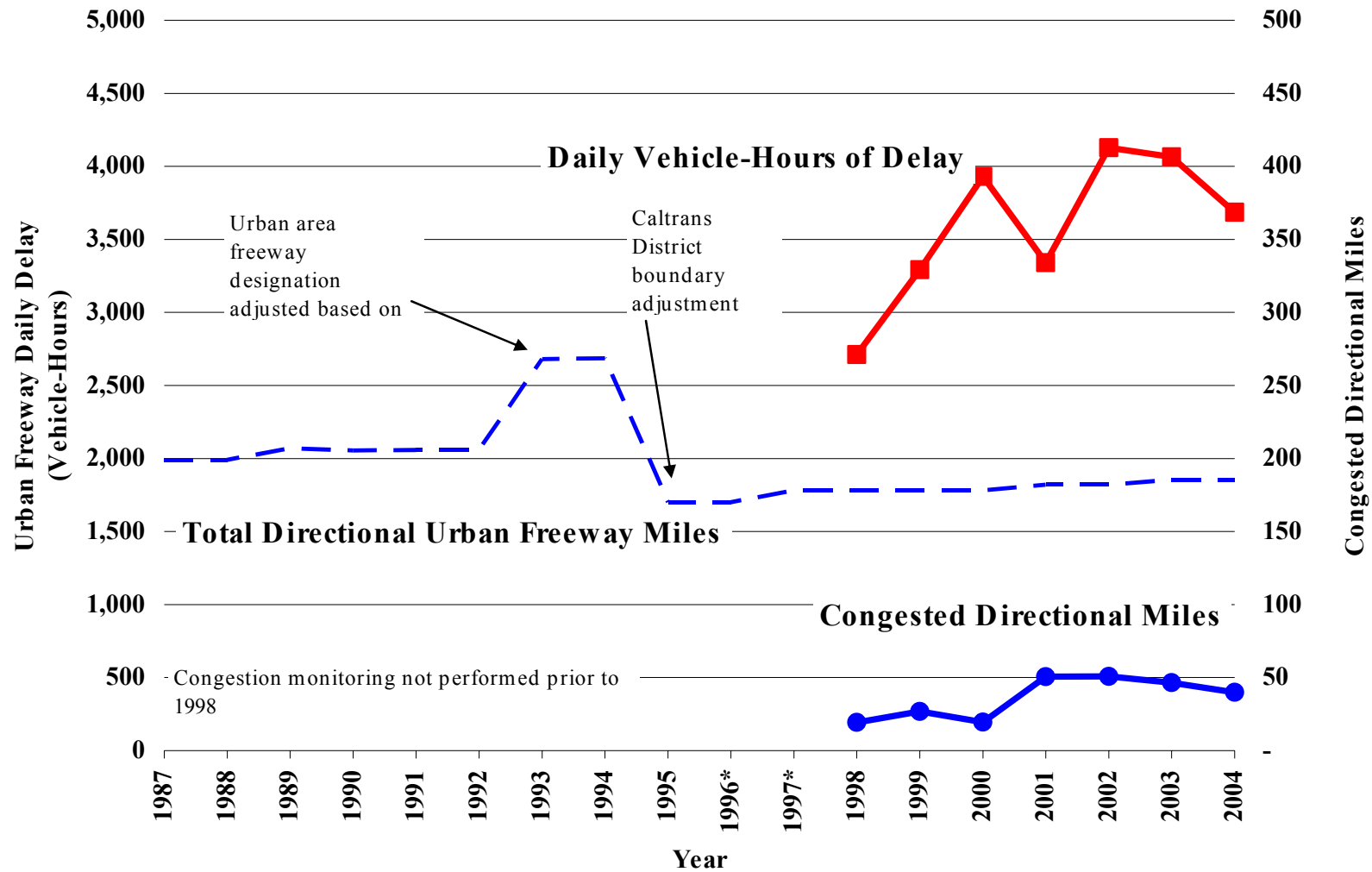
Both the 2003 and 2004 data used in this statewide congestion monitoring report are based on fall data collection efforts. District 10 has been monitoring traffic congestion for the HICOMP report since 1998.

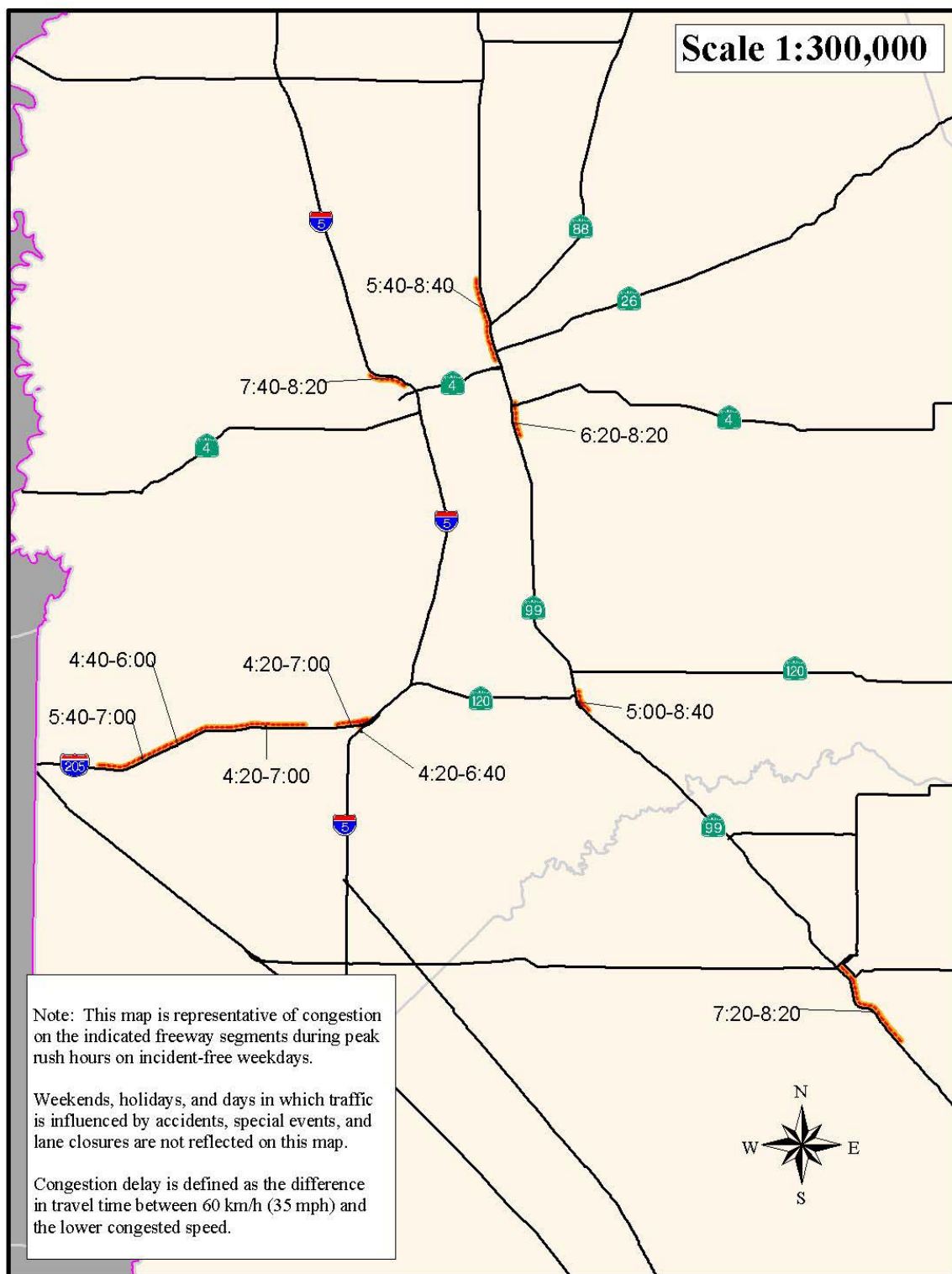
In 2004, the total vhdpd were 3,685 compared to 4,064 hours reported for 2003 (a 9 percent decrease). CDM were almost 40 miles in 2004, down nearly seven miles from 2003.

Exhibit 3-25: District 10 Highway Congestion Summary

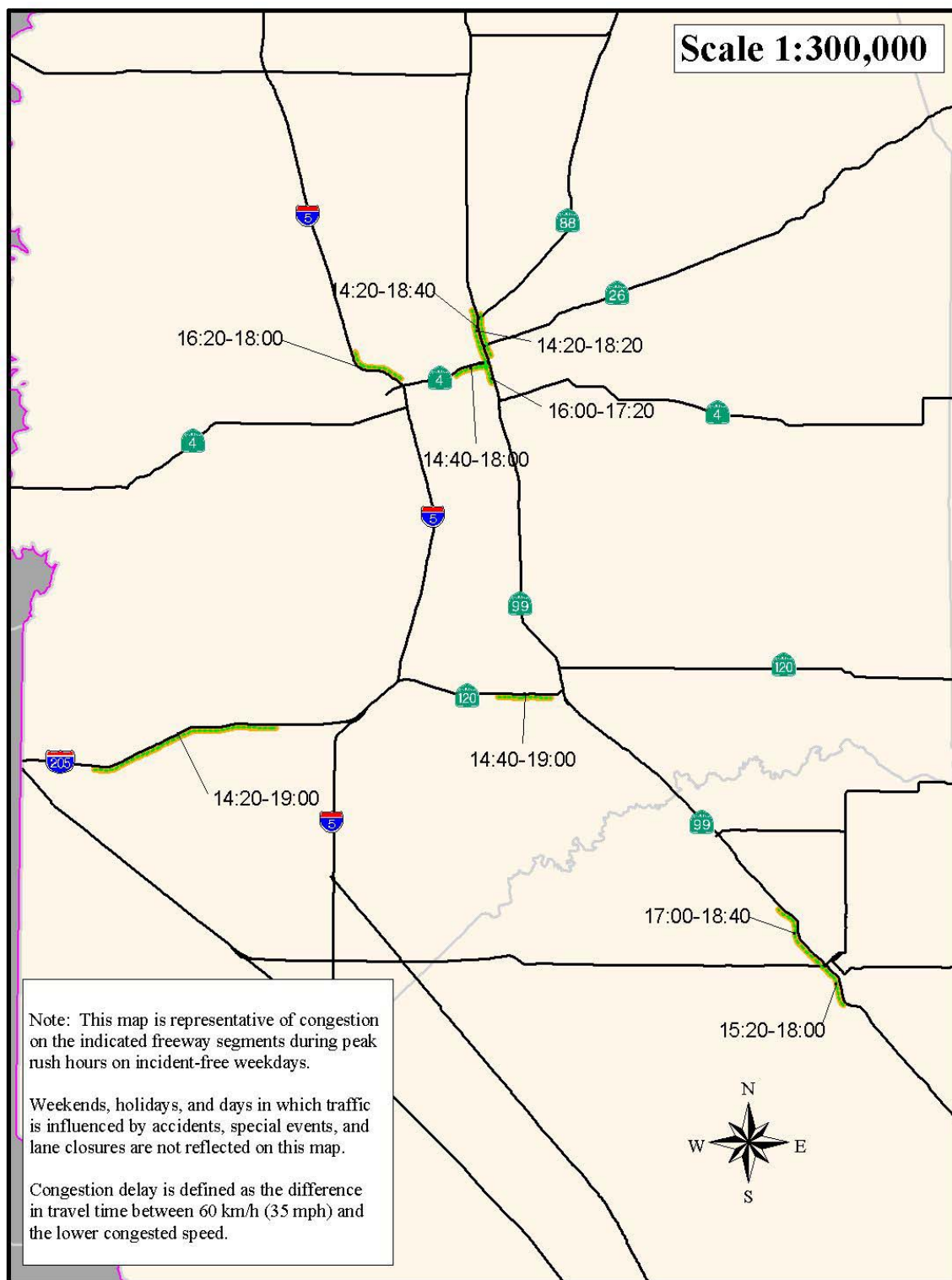
District 10	2003	2004	Percent Change 2003-2004	Percent of Statewide 2004
Daily Vehicle-Hours of Delay	4,064	3,685	-9%	1%
San Joaquin	3,635	3,383	-7%	
Stanislaus	429	302	-30%	
Congested Directional Miles	46.5	39.9	-14%	2%
San Joaquin	40.3	31.7	-21%	
Stanislaus	6.2	8.3	33%	
Total Urban Area Freeway Directional Miles	185.4	185.4		
Congested Miles/Total Urban Freeway Miles	25%	22%		

Exhibit 3-26: District 10 Congestion Trends 1998-2004





**EXHIBIT 3-27
DISTRICT 10
STOCKTON AREA
2004 A.M. CONGESTION MAP**



**EXHIBIT 3-28
DISTRICT 10
STOCKTON AREA
2004 P.M. CONGESTION MAP**

3.8 *District 11: San Diego Area*

Exhibit 3-29 summarizes weekday recurrent congestion in District 11 during 2004 compared to 2003. Exhibit 3-30 presents trends in vhdpd and cdm for the district. Exhibits 3-31 and 3-32 are maps showing the location and duration of A.M. and P.M. period congestion.

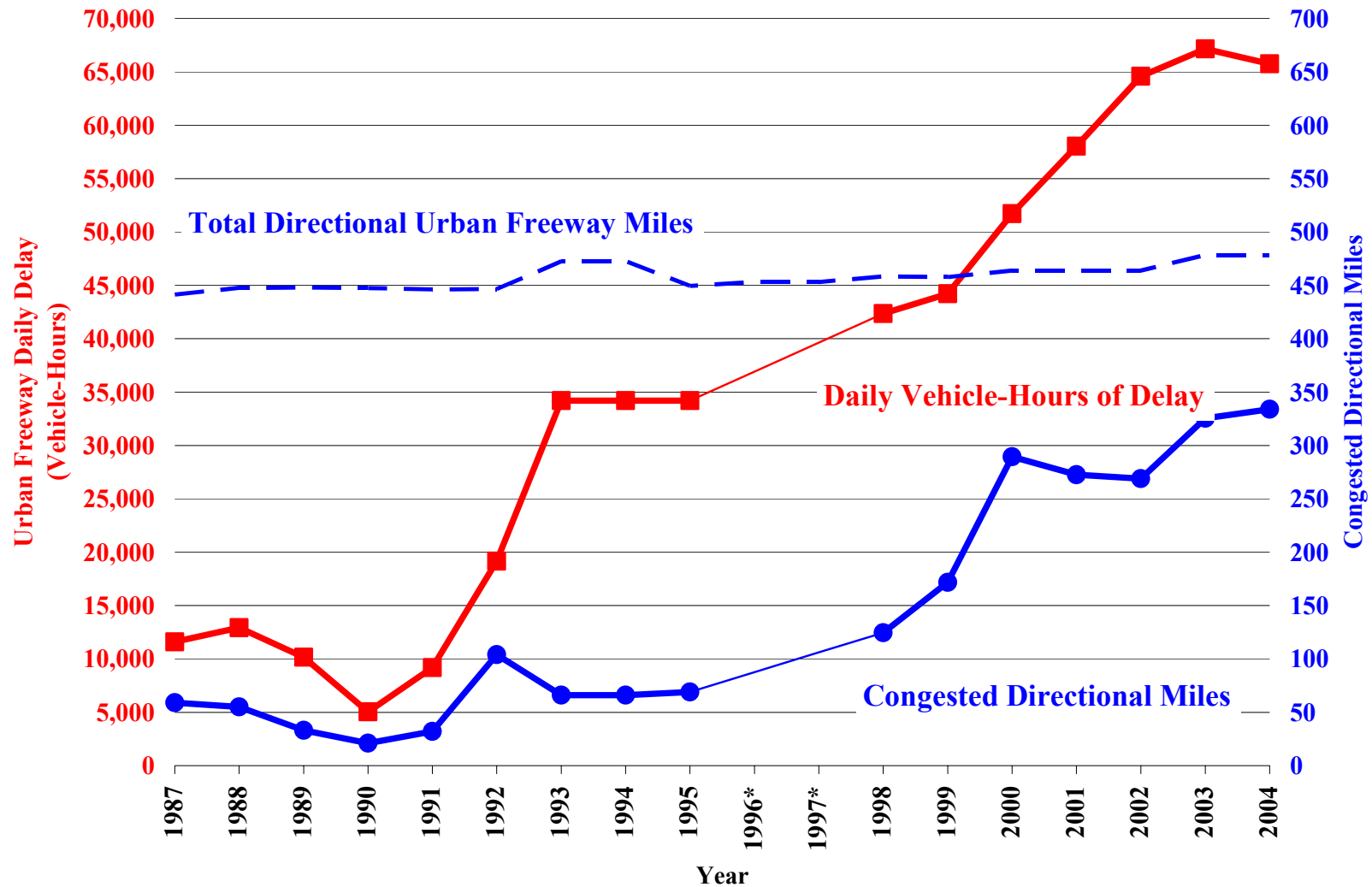
Both the 2003 and 2004 data used in this statewide congestion monitoring report are based on fall data collection efforts only. Prior to 1998, delay estimates were based on both spring and fall probe vehicle data. Since 1998, District 11 has been using fall automatically collected detector data to estimate delay for many route segments. Other segments were monitored using probe vehicles.

In 2004, the total vhdpd were 65,768 compared to 67,163 hours reported for 2003 (a decrease of 2 percent). CDM were 333.9 miles in 2004, a 3 percent increase from the 325.5 miles in 2003.

Exhibit 3-29: District 11 Highway Congestion Summary

District 11	2003	2004	Percent Change 2003-2004	Percent of Statewide 2004
Daily Vehicle-Hours of Delay	67,163	65,768	-2%	13%
San Diego	67,163	65,768	-2%	
Congested Directional Miles	325.5	333.9	3%	17%
San Diego	325.5	333.9	3%	
Total Urban Area Freeway Directional Miles	478.4	478.4		
Congested Miles/Total Urban Freeway Miles	68%	70%		

Exhibit 3-30: District 11 Congestion Trends 1987-2004



* No statewide report developed in 1996 or 1997.



**EXHIBIT 3-31
DISTRICT 11
SAN DIEGO AREA
2004 A.M. CONGESTION MAP**



**EXHIBIT 3-32
DISTRICT 11
SAN DIEGO AREA
2004 P.M. CONGESTION MAP**

3.9 District 12: Orange County

Exhibit 3-33 summarizes weekday recurrent congestion in District 12 during 2004 compared to 2003. Exhibit 3-34 presents trends in vhdpd and cdm for the district. Exhibits 3-35 and 3-36 are maps showing the location and duration of A.M. and P.M. period congestion.

The 2003 data were derived from automatically collected data, which differs from how data had been collected in the past. New data collected in 2004 were used to adjust the 2003 numbers.

In 2004, the total vhdpd were 96,522 compared to the adjusted 83,002 hours for 2003 (a 16 percent increase). This increase can be partially attributed to a methodological change incorporated in 2004. CDM in 2004 were 190.3 compared to an adjusted 211.5 in 2003 (a 10 percent decline).

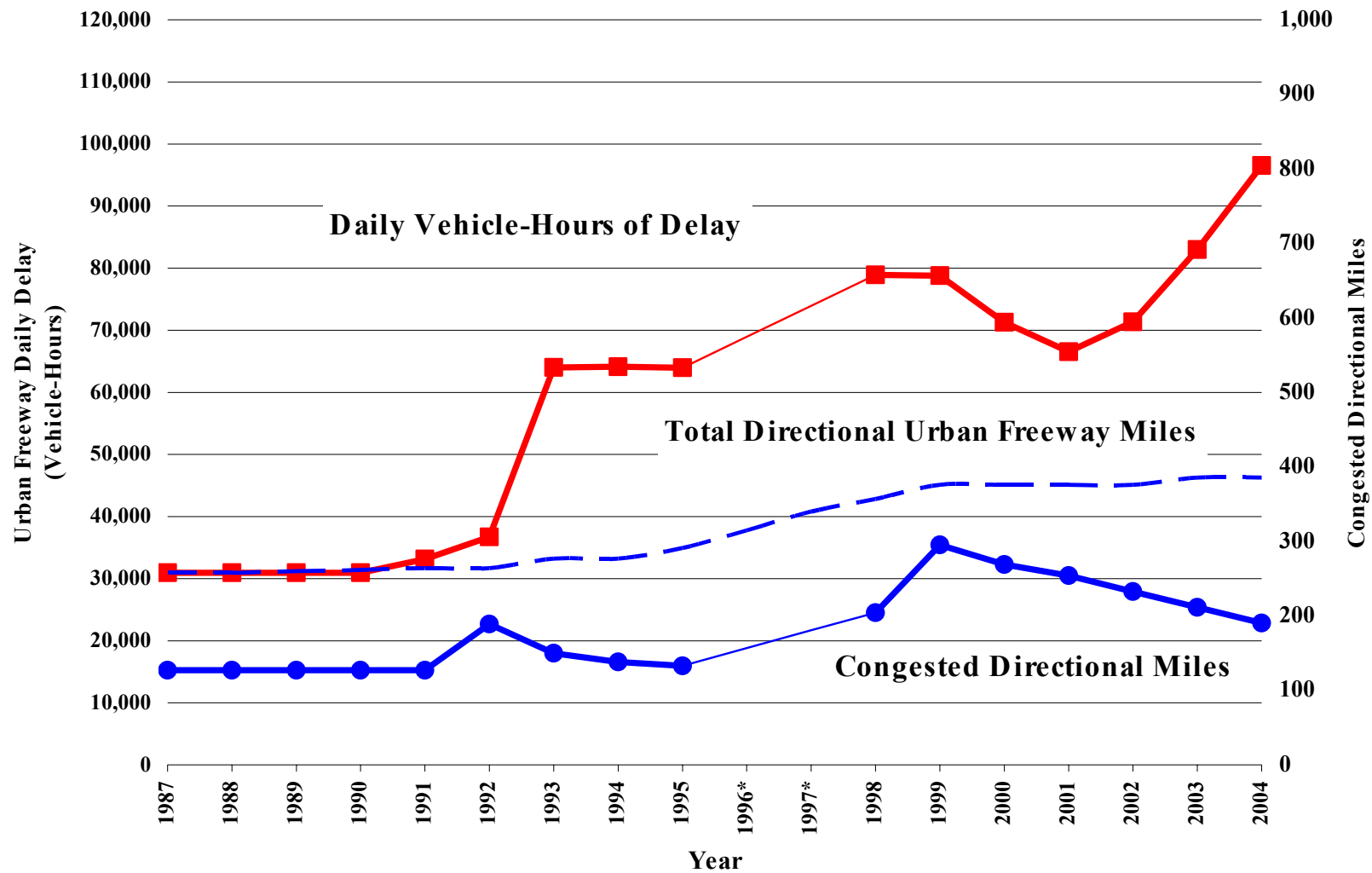
Exhibit 3-33: District 12 Highway Congestion Summary

District 12	2003*	2004	Percent Change 2003-2004	Percent of Statewide 2004
Daily Vehicle-Hours of Delay	83,002	96,522	16%	19%
Orange	83,002	96,522	16%	
Congested Directional Miles	211.5	190.3	-10%	10%
Orange	211.5	190.3	-10%	
Total Urban Area Freeway Directional Miles	385.5	385.5		
Congested Miles/Total Urban Freeway Miles	55%	49%		

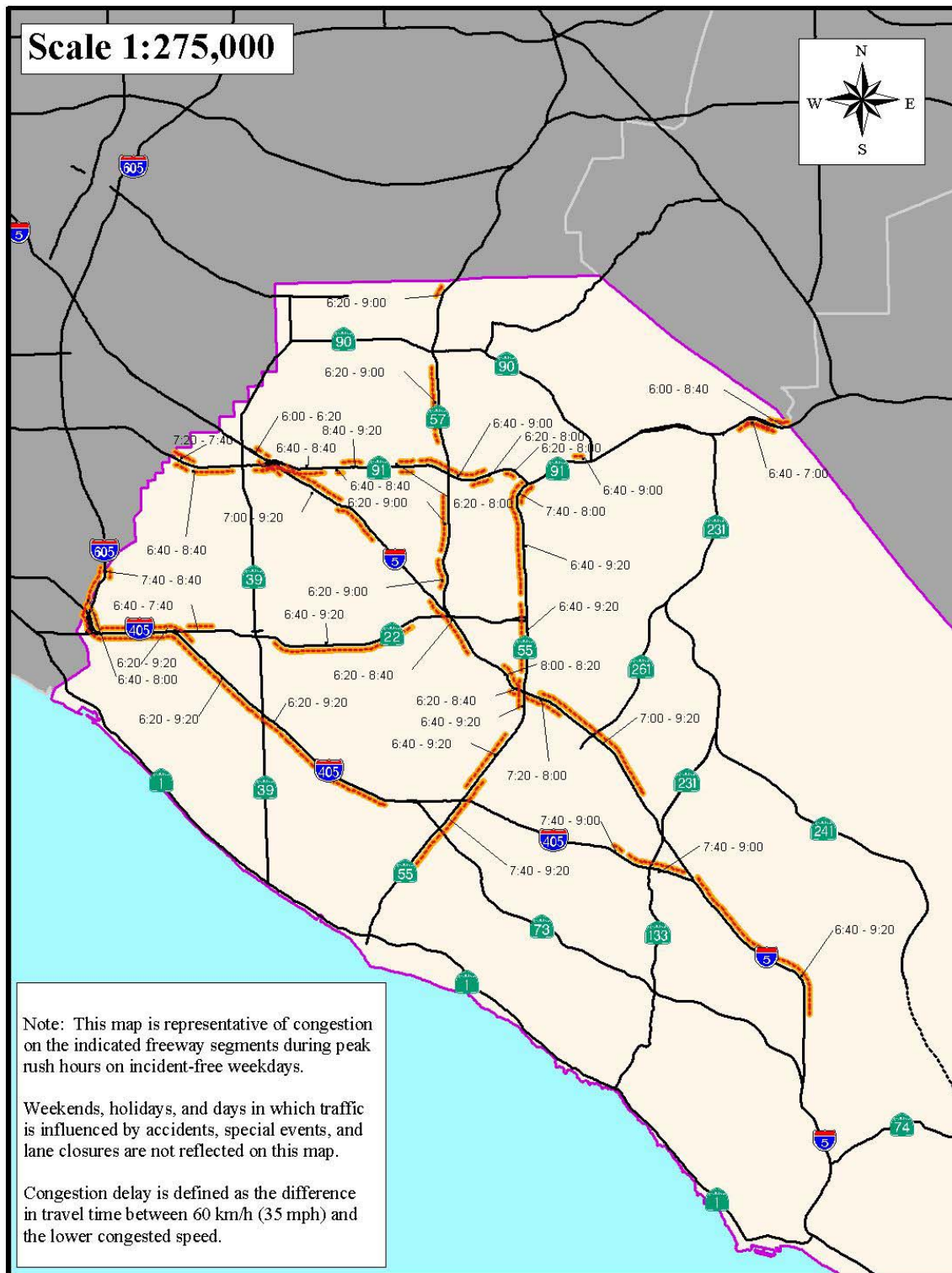
* Daily vehicle-hours of delay for 2003 were originally estimated and have been adjusted upwards based on 2004 trends.

* The district incorporated a methodological change in 2004, which contributed to the increase in overall delay reported. Congested miles for 2003 were recalculated based on new findings by district.

Exhibit 3-34: District 12 Congestion Trends 1987-2004



* No statewide report developed in 1996 or 1997.

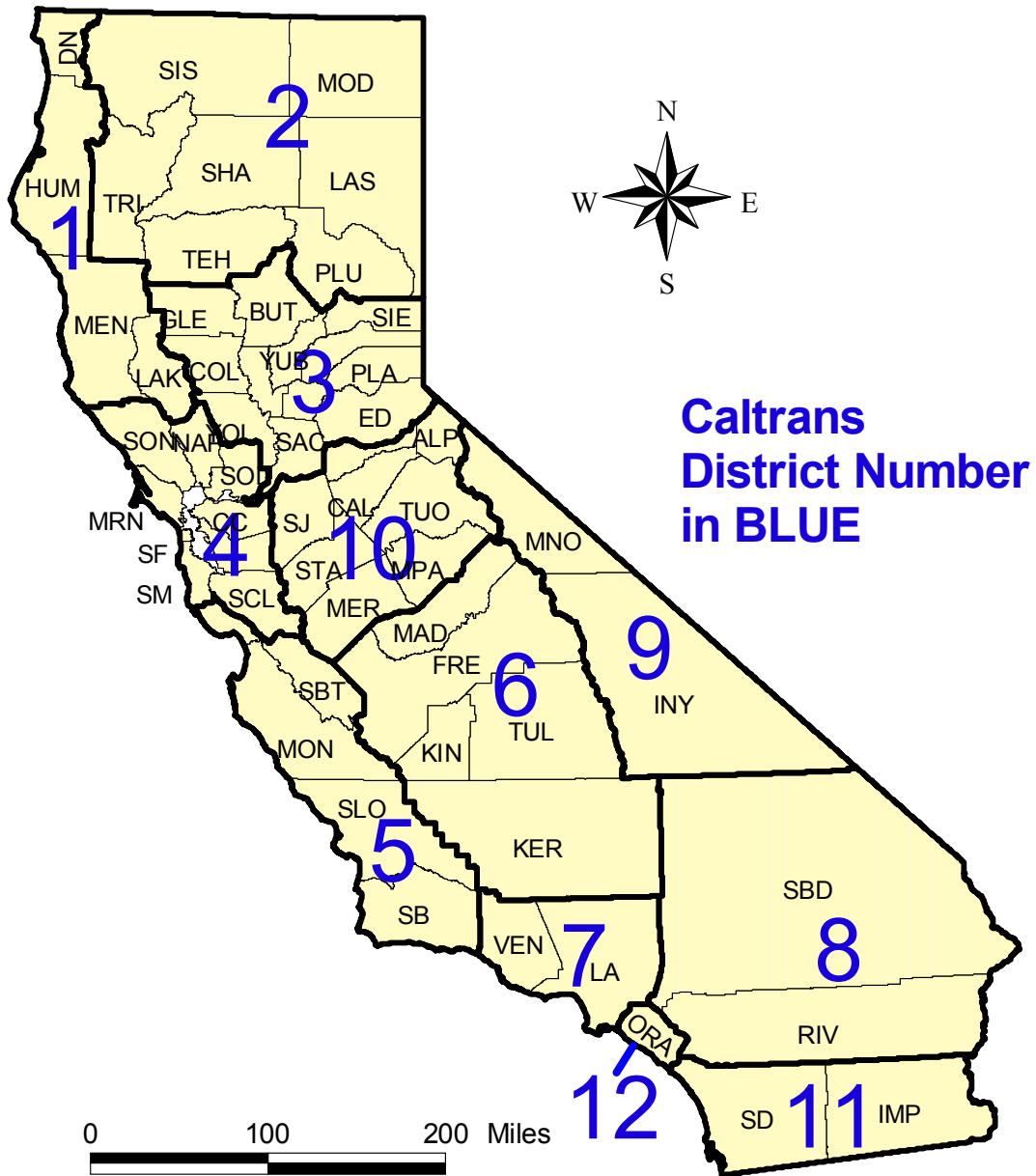


**EXHIBIT 3-35
DISTRICT 12
ORANGE COUNTY
2004 A.M. CONGESTION MAP**



**EXHIBIT 3-36
DISTRICT 12
ORANGE COUNTY
2004 P.M. CONGESTION MAP**

Appendix A: Caltrans District and County Map



Appendix B: Caltrans Contacts

District	Contact Person	Public Number	Email Address
03	Matt Taghipour	(916) 859-7950	Matt_Taghipour@dot.ca.gov
04	Ron Kyutoku	(510) 286-4640	Ron_Kyutoku@dot.ca.gov
05	Roger D. Barnes	(805) 594-6190	Roger_D_Barnes@dot.ca.gov
06	Albert Lee	(559) 488-4111	Albert_Lee@dot.ca.gov
07	Kirk Patel	(213) 897-1825	Kirk_Patel@dot.ca.gov
08	Mohammed Bendelhoum	(909) 383-6452	mohammed_bendelhoum@dot.ca.gov
10	Arlene Cordero	(209) 948-3894	Arlene_Cordero@dot.ca.gov
11	Foroud Khadem	(619) 718-7848	Foroud_Khadem@dot.ca.gov
12	Farid Nowshiravan	(949) 756-7639	Farid_Nowshiravan@dot.ca.gov
HQ	Rex Cluff	(916) 651-9059	Rex_Cluff@dot.ca.gov

Appendix C: Glossary of Terms

Directional Mile – A one-mile length of freeway has two directional miles, irrespective of number of lanes.

Duration – The length of time the freeway directional segment remains congested expressed in hours.

Extent – The length of freeway segment, by direction, experiencing speeds below 35 mph for 15 minutes or more. Extent is expressed in terms of congested directional miles (cdm).

Freeway Service Patrol (FSP) – Free tow service that assists disabled motorists in congested urban areas.

High Occupancy Vehicle Lanes (HOV) – Lanes on freeways restricted to vehicles carrying more than one person or to public transportation vehicles. Minimum vehicle occupancies can be either two or three people depending on the highway segment. HOV lanes are designed to encourage ridesharing.

Magnitude – The difference in travel time between 35 mph and the lower congested speed and is expressed in terms of vehicle-hours of delay per day (vhdpd).

Metered Connector – Ramp meter on a freeway-to-freeway connector.

Non-Recurrent Congestion – Caused by events that occur irregularly such as accidents, sporting events, and maintenance or construction.

Ramp Metering – Signal on a ramp to regulate the flow of traffic onto the freeway.

Recurrent Congestion – A condition lasting for 15 minutes or longer where travel demand exceeds freeway design capacity, as evident by vehicular speeds of 35 mph or less occurring during peak commute periods on a typical, incident-free weekday.

Surveillance Stations – All detector locations including ramp-metering stations are termed surveillance stations.

Arnold Schwarzenegger
Governor

Sunne Wright McPeak
Secretary, Business, Transportation and Housing Agency

Will Kempton
Director, California Department of Transportation

Kris Balaji
Division Chief, Traffic Operations

**For more information or additional copies of this report, please
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